DIGITAL

Can OBD2

Diagnostic Tool

OWNER'S MANUAL

The Easiest And Best Way To Troubleshoot 1996 and Newer OBD2 Vehicles!

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WHAT IS OBD?

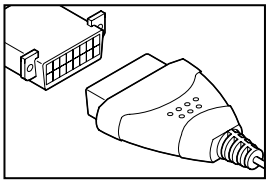
The Enhanced CanOBD2 Diagnostic Tool is designed to work on all OBD2 compliant vehicles. All 1996 and newer vehicles (cars, light trucks and SUVs) sold in the United States are OBD2 compliant.

One of the most exciting improvements in the automobile industry was the addition of on-board diagnostics (OBD) on vehicles, or in more basic terms, the computer that activates the vehicle's "CHECK ENGINE" light. OBD1 was designed to monitor manufacturer-specific systems on vehicles built from 1981 to 1995. Then came the development of OBD2, which is on all 1996 and newer vehicles sold in the U.S. Like its predecessor, OBD2 was adopted as part of a government mandate to lower vehicle emissions. But what makes OBD2 unique is its universal application for all late model cars and trucks - domestic and import. This sophisticated program in the vehicle's main computer system is designed to detect failures in a range of systems, and can be accessed through a universal OBD2 port, which is usually found under the dashboard. For all OBD systems, if a problem is found, the computer turns on the "CHECK ENGINE" light to warn the driver, and sets a Diagnostic Trouble Code (DTC) to identify where the problem occurred. A special diagnostic tool, such as the Enhanced CanOBD2 Diagnostic Tool, is required to retrieve these codes, which consumers and professionals use as a starting point for repairs.

The Enhanced CanOBD2 Diagnostic Tool provides the additional ability to retrieve *enhanced* DTCs from most Chrysler/Jeep, Ford/Mazda, GM/Isuzu, Honda/Acura and Toyota/Lexus vehicles, as well as Anti-Lock Brake System (ABS) DTCs and vehicle information. The types of enhanced data available depends on the vehicle make.

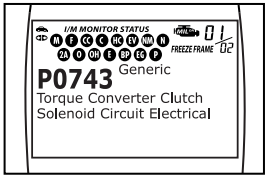
To learn more about vehicle Computer Control Systems and OBD2, see COMPUTER ENGINE CONTROLS on page 15.

Easy To Use . . . .



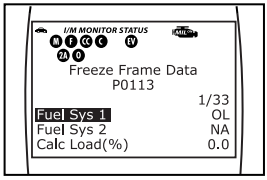
- Connect the Diagnostic Tool to the vehicle's test connector.
- Turn the ignition key "On."
- The Diagnostic Tool automatically links to the vehicle's computer.

Easy To View . . . .



- The Diagnostic Tool retrieves stored codes, Freeze Frame data and System Status.
- Codes, I/M Monitor Status and Freeze Frame data are displayed on the Diagnostic Tool's LCD display screen. System Status is indicated by LED indicators.

Easy To Define . . . .



- Read code definitions from the Diagnostic Tool's LCD display.
- View Freeze Frame data.

SAFETY FIRST!

To avoid personal injury, instrument damage and/or damage to your vehicle; do not use the OBD2 Diagnostic Tool before reading this manual.

This manual describes common test procedures used by experienced service technicians. Many test procedures require precautions to avoid accidents that can result in personal injury, and/or damage to your vehicle or test equipment. Always read your vehicle's service manual and follow its safety precautions before and during any test or service procedure. **ALWAYS** observe the following general safety precautions:

When an engine is running, it produces carbon monoxide, a toxic and poisonous gas. To prevent serious injury or death from carbon monoxide poisoning, operate the vehicle **ONLY** in a **well-ventilated** area.

To protect your eyes from propelled objects as well as hot or caustic liquids, **always** wear **approved** safety eye protection.

When an engine is running, many parts (such as the coolant fan, pulleys, fan belt etc.) turn at high speed. To avoid serious injury, always be aware of moving parts. Keep a safe distance from these parts as well as other potentially moving objects.

Engine parts become very hot when the engine is running. To prevent severe burns, avoid contact with hot engine parts.

Before starting an engine for testing or troubleshooting, make sure the parking brake is engaged. Put the transmission in **park** (for automatic transmission) or **neutral** (for manual transmission). Block the drive wheels with suitable blocks.

Connecting or disconnecting test equipment when the ignition is **ON** can damage test equipment and the vehicle's electronic components. Turn the ignition **OFF** before connecting the Diagnostic Tool to or disconnecting the Diagnostic Tool from the vehicle's Data Link Connector (DLC).

To prevent damage to the on-board computer when taking vehicle electrical measurements, always use a digital multimeter with at least 10 MegOhms of impedance.

Fuel and battery vapors are highly flammable. To prevent an explosion, keep all sparks, heated items and open flames away from the battery and fuel / fuel vapors. DO NOT SMOKE NEAR THE VEHICLE DURING TESTING.

Don't wear loose clothing or jewelry when working on an engine. Loose clothing can become caught in the fan, pulleys, belts, etc. Jewelry is highly conductive, and can cause a severe burn if it makes contact between a power source and ground.

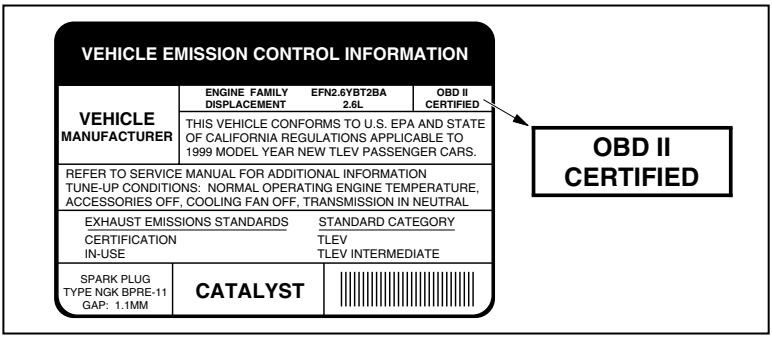
VEHICLES COVERED

The Enhanced CanOBD2 Diagnostic Tool is designed to work on all OBD2 compliant vehicles. All 1996 and newer vehicles (cars and light trucks) sold in the United States are OBD2 compliant.

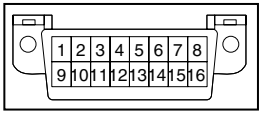
Federal law requires that all 1996 and newer cars and light trucks sold in the United States must be OBD2 compliant; this includes all Domestic, Asian and European vehicles.

Some 1994 and 1995 vehicles are OBD2 compliant. To find out if a 1994 or 1995 vehicle is OBD2 compliant, check the following:

1. **The Vehicle Emissions Control Information (VECI) Label.** This label is located under the hood or by the radiator of most vehicles. If the vehicle is OBD2 compliant, the label will state "**OBD II Certified**."



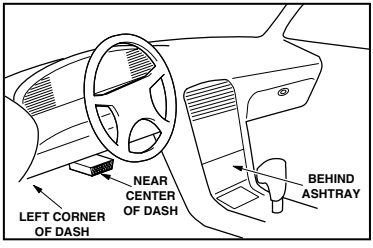
2. Government Regulations require that all OBD2 compliant vehicles must have a "common" sixteen-pin **Data Link Connector (DLC)**.



Some 1994 and 1995 vehicles have 16-pin connectors but are not OBD2 compliant. Only those vehicles with a Vehicle Emissions Control Label stating "OBD II Certified" are OBD2 compliant.

Data Link Connector (DLC) Location

The 16-pin DLC is usually located under the instrument panel (dash), within 12 inches (300 mm) of center of the panel, on the driver's side of most vehicles. It should be easily accessible and visible from a kneeling position outside the vehicle with the door open.



On some Asian and European vehicles the DLC is located behind the "ashtray" (the ashtray must be removed to access it) or on the far left corner of the dash. If the DLC cannot be located, consult the vehicle's service manual for the location.

BATTERY REPLACEMENT

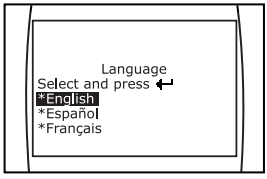
Replace batteries when the battery symbol is visible on display and/or the 3 LEDS are all lit and no other data is visible on screen.

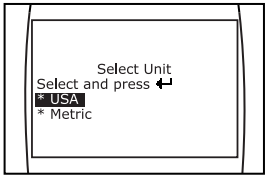
1. Locate the battery cover on the back of the Diagnostic Tool.
2. Slide the battery cover off (use your fingers).
3. Replace batteries with two AA-size batteries (for longer life, use Alkaline-type batteries).
4. Reinstall the battery cover on the back of the Diagnostic Tool.

Adjustments After Battery Installation

The first time the unit is turned on, you must select the desired display language (English, French or Spanish) and unit of measurement (USA or Metric) as follows:

1. Press the **POWER/LINK** button to turn the Diagnostic Tool "ON."
   - The Select Language screen displays.
2. Use the **DOWN** button to highlight the desired display language.
3. When the desired display language is selected, press the **ENTER** button to confirm your selection.
   - The Select Unit screen displays.
4. Use the **DOWN** button to highlight the desired unit of measurement.





5. When the desired unit of measurement is selected, press the **ENTER** button to confirm your selection.

After the initial language and unit of measurement selections are performed, these, as well as other settings, can be changed as desired. Proceed to "ADJUSTMENTS AND SETTINGS" on page 60 for further instructions.

CONTROLS AND INDICATORS

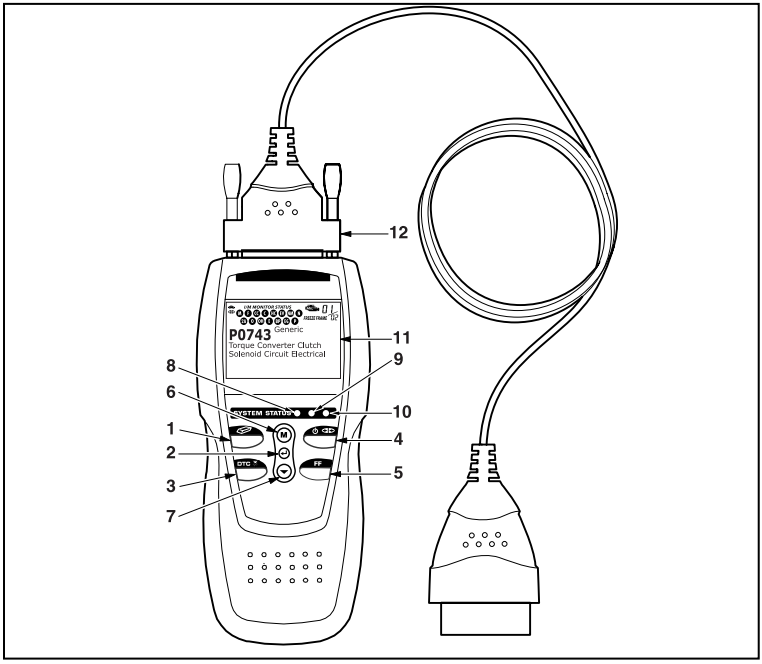


Figure 1. Controls and Indicators

See Figure 1 for the locations of items 1 through 12, below.

1. **ERASE button** - Erases Diagnostic Trouble Codes (DTCs), and "Freeze Frame" data from your vehicle's computer, and resets Monitor status.
2. **ENTER button** - When in Menu mode, confirms the selected option or value.
3. **DTC button** - Displays the DTC View screen and/or scrolls the LCD display to view DTCs.
4. **POWER/LINK button** - When the Diagnostic Tool IS NOT connected to a vehicle, turns the Diagnostic Tool "**On**" and "**Off**". When the Diagnostic Tool is connected to a vehicle, links the Diagnostic Tool to the vehicle's PCM to retrieve diagnostic data from the computer's memory.

   *To turn the Diagnostic Tool "On", you must press and hold the **POWER/LINK** button for approximately 3 seconds.*

5. **ABS button** - When pressed, displays the ABS DTCs menu.
6. **M button** – When pressed while linked to a vehicle, displays the "Main Menu."

7. ⊙ **DOWN button** - When in MENU mode, scrolls DOWN through the menu and submenu selection options. When retrieving and viewing DTCs, scrolls down through the current display screen to display any additional data.
8. **GREEN LED** - Indicates that all engine systems are running normally (all Monitors on the vehicle are active and performing their diagnostic testing, and no DTCs are present).
9. **YELLOW LED** - Indicates there is a possible problem. A "Pending" DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing.
10. **RED LED** - Indicates there is a problem in one or more of the vehicle's systems. The red LED is also used to show that DTC(s) are present. DTCs are shown on the Diagnostic Tool's LCD display. In this case, the Malfunction Indicator ("Check Engine") lamp on the vehicle's instrument panel will light steady on.
11. **LCD Display** - Displays settings Menu and submenus, test results, Diagnostic Tool functions and Monitor status information. See DISPLAY FUNCTIONS, on next page, for more details.
12. **CABLE** - Connects the Diagnostic Tool to the vehicle's Data Link Connector (DLC).

DISPLAY FUNCTIONS

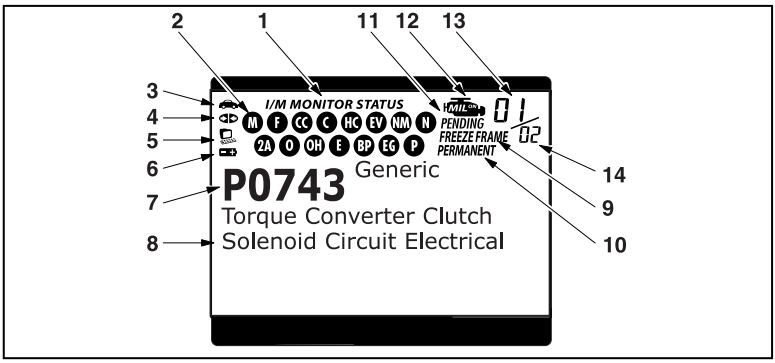


Figure 2. Display Functions

See Figure 2 for the locations of items 1 through 14, below.

1. **I/M MONITOR STATUS field** - Identifies the I/M Monitor status area.
2. **Monitor icons** - Indicate which Monitors are supported by the vehicle under test, and whether or not the associated Monitor has run its diagnostic testing (Monitor status). When a Monitor icon is solid, it indicates that the associated Monitor has completed its diagnostic testing. When a Monitor icon is flashing, it indicates that the vehicle supports the associated Monitor, but the Monitor has not yet run its diagnostic testing.
3. **Vehicle icon** - Indicates whether or not the Diagnostic Tool is being properly powered through the vehicle's Data Link Connector (DLC). A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
4. **Link icon** - Indicates whether or not the Diagnostic Tool is communicating (linked) with the vehicle's on-board computer. When visible, the Diagnostic Tool is communicating with the computer. If the Link icon is not visible, the Diagnostic Tool is not communicating with the computer.
5. **Computer icon** - When this icon is visible it indicates that the Diagnostic Tool is linked to a personal computer. Optional software is available that makes it possible to upload retrieved data to a personal computer.
6. **Diagnostic Tool Internal Battery icon** - When visible, indicates the Diagnostic Tool batteries are "low" and should be replaced. If the batteries are not replaced when the battery symbol is "on", all 3 LEDs will light up as a last resort indicator to warn you that the batteries need replacement. No data will be displayed on screen when all 3 LEDs are lit.

7. **DTC Display Area** - Displays the Diagnostic Trouble Code (DTC) number. Each fault is assigned a code number that is specific to that fault.
8. **Test Data Display Area** - Displays DTC definitions, Freeze Frame data, and other pertinent test information messages.
9. **FREEZE FRAME icon** - Indicates that there is Freeze Frame data from "Priority Code" (Code #1) stored in the vehicle's computer memory.
10. **PERMANENT icon** - Indicates the currently displayed DTC is a "Permanent" code.
11. **PENDING icon** - Indicates the currently displayed DTC is a "Pending" code.
12. **MIL icon** - Indicates the status of the Malfunction Indicator Lamp (MIL). The MIL icon is visible only when a DTC has commanded the MIL on the vehicle's dashboard to light.
13. **Code Number Sequence** - The Diagnostic Tool assigns a sequence number to each DTC that is present in the computer's memory, starting with "01." This number indicates which code is currently displayed. Code number "01" is always the highest priority code, and the one for which "Freeze Frame" data has been stored.

    If "01" is a "Pending" code, there may or may not be "Freeze Frame" data stored in memory.
14. **Code Enumerator** - Indicates the total number of codes retrieved from the vehicle's computer.

COMPUTER ENGINE CONTROLS

The Introduction of Electronic Engine Controls

Electronic Computer Control Systems make it possible for vehicle manufacturers to comply with the tougher emissions and fuel efficiency standards mandated by State and Federal Governments.

As a result of increased air pollution (smog) in large cities, such as Los Angeles, the California Air Resources Board (**CARB**) and the Environmental Protection Agency (**EPA**) set new regulations and air pollution standards to deal with the problem. To further complicate matters, the energy crisis of the early 1970s caused a sharp increase in fuel prices over a short period. As a result, vehicle manufacturers were not only required to comply with the new emissions standards, they also had to make their vehicles more fuel-efficient. Most vehicles were required to meet a miles-per-gallon (MPG) standard set by the U.S. Federal Government.

Precise fuel delivery and spark timing are needed to reduce vehicle emissions. Mechanical engine controls in use at the time (such as ignition points, mechanical spark advance and the carburetor) responded too slowly to driving conditions to properly control fuel delivery and spark timing. This made it difficult for vehicle manufacturers to meet the new standards.

A new Engine Control System had to be designed and integrated with the engine controls to meet the stricter standards. The new system had to:

- Respond instantly to supply the proper mixture of air and fuel for any driving condition (idle, cruising, low-speed driving, high-speed driving, etc.).
- Calculate instantly the best time to “ignite” the air/fuel mixture for maximum engine efficiency.
- Perform both these tasks without affecting vehicle performance or fuel economy.

Vehicle Computer Control Systems can perform millions of calculations each second. This makes them an ideal substitute for the slower mechanical engine controls. By switching from mechanical to electronic engine controls, vehicle manufacturers are able to control fuel delivery and spark timing more precisely. Some newer Computer Control Systems also provide control over other vehicle functions, such as transmission, brakes, charging, body, and suspension systems.

The Basic Engine Computer Control System

The Computer Control System consists of an on-board computer and several related control devices (sensors, switches, and actuators).

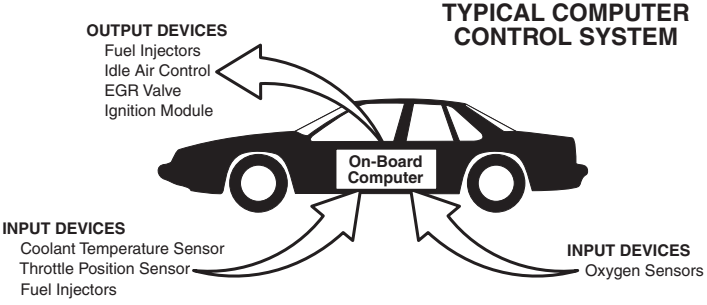
The on-board computer is the heart of the Computer Control System. The computer contains several programs with preset reference values for air/fuel ratio, spark or ignition timing, injector pulse width, engine speed, etc. Separate values are provided for various driving conditions, such as idle, low speed driving, high-speed driving, low load, or high load. The preset reference values represent the ideal air/fuel mixture, spark timing, transmission gear selection, etc., for any driving condition. These values are programmed by the vehicle manufacturer, and are specific to each vehicle model.

Most on-board computers are located inside the vehicle behind the dashboard, under the passenger's or driver's seat, or behind the right kick panel. However, some manufacturers may still position it in the engine compartment.

Vehicle sensors, switches, and actuators are located throughout the engine, and are connected by electrical wiring to the on-board computer. These devices include oxygen sensors, coolant temperature sensors, throttle position sensors, fuel injectors, etc. Sensors and switches are **input devices**. They provide signals representing current engine operating conditions to the computer. Actuators are **output devices**. They perform actions in response to commands received from the computer.

The on-board computer receives information inputs from sensors and switches located throughout the engine. These devices monitor critical engine conditions such as coolant temperature, engine speed, engine load, throttle position, air/fuel ratio etc.

The computer compares the values received from these sensors with its preset reference values, and makes corrective actions as needed so that the sensor values always match the preset reference values for the current driving condition. The computer makes adjustments by commanding other devices such as the fuel injectors, idle air control, EGR valve or Ignition Module to perform these actions.



Vehicle operating conditions are constantly changing. The computer continuously makes adjustments or corrections (especially to the air/fuel mixture and spark timing) to keep all the engine systems operating within the preset reference values.

On-Board Diagnostics - First Generation (OBD1)

With the exception of some 1994 and 1995 vehicles, most vehicles from 1982 to 1995 are equipped with some type of first generation On-Board Diagnostics.

Beginning in 1988, California's Air Resources Board (**CARB**), and later the Environmental Protection Agency (**EPA**) required vehicle manufacturers to include a self-diagnostic program in their on-board computers. The program would be capable of identifying emissions-related faults in a system. The first generation of Onboard Diagnostics came to be known as **OBD1**.

OBD1 is a set of self-testing and diagnostic instructions programmed into the vehicle's on-board computer. The programs are specifically designed to detect failures in the sensors, actuators, switches and wiring of the various vehicle emissions-related systems. If the computer detects a failure in any of these components or systems, it lights an indicator on the dashboard to alert the driver. The indicator lights **only** when an emissions-related problem is detected.

The computer also assigns a numeric code for each specific problem that it detects, and stores these codes in its memory for later retrieval. These codes can be retrieved from the computer's memory with the use of a "Diagnostic Tool" or a "Scan Tool."

On-Board Diagnostics - Second Generation (OBD2)

The OBD2 System is an enhancement of the OBD1 System.

In addition to performing all the functions of the OBD1 System, the OBD2 System has been enhanced with new Diagnostic Programs. These programs closely monitor the functions of various emissions-related components and systems (as well as other systems) and make this information readily available (with the proper equipment) to the technician for evaluation.

The California Air Resources Board (**CARB**) conducted studies on OBD1 equipped vehicles. The information that was gathered from these studies showed the following:

- A large number of vehicles had deteriorating or degraded emissions-related components. These components were causing an increase in emissions.

- Because OBD1 systems only detect failed components, the degraded components were not setting codes.
- Some emissions problems related to degraded components only occur when the vehicle is being driven under a load. The emission checks being conducted at the time were not performed under simulated driving conditions. As a result, a significant number of vehicles with degraded components were passing Emissions Tests.
- Codes, code definitions, diagnostic connectors, communication protocols and emissions terminology were different for each manufacturer. This caused confusion for the technicians working on different make and model vehicles.

To address the problems made evident by this study, CARB and the EPA passed new laws and standardization requirements. These laws required that vehicle manufacturers to equip their new vehicles with devices capable of meeting all of the new emissions standards and regulations. It was also decided that an enhanced on-board diagnostic system, capable of addressing all of these problems, was needed. This new system is known **as "On-Board Diagnostics Generation Two (OBD2)**." The primary objective of the OBD2 system is to comply with the latest regulations and emissions standards established by CARB and the EPA.

The Main Objectives of the OBD2 System are:

- To detect degraded and/or failed emissions-related components or systems that could cause tailpipe emissions to exceed by 1.5 times the Federal Test Procedure (FTP) standard.
- To expand emissions-related system monitoring. This includes a set of computer run diagnostics called Monitors. Monitors perform diagnostics and testing to verify that all emissions-related components and/or systems are operating correctly and within the manufacturer's specifications.
- To use a standardized Diagnostic Link Connector (DLC) in all vehicles. (Before OBD2, DLCs were of different shapes and sizes.)
- To standardize the code numbers, code definitions and language used to describe faults. (Before OBD2, each vehicle manufacturer used their own code numbers, code definitions and language to describe the same faults.)
- To expand the operation of the Malfunction Indicator Lamp (MIL).
- To standardize communication procedures and protocols between the diagnostic equipment (Scan Tools, Code Readers, etc.) and the vehicle's on-board computer.

OBD2 Terminology

The following terms and their definitions are related to OBD2 systems. Read and reference this list as needed to aid in the understanding of OBD2 systems.

- **Powertrain Control Module (PCM)** - The PCM is the OBD2 accepted term for the vehicle's "on-board computer." In addition to controlling the engine management and emissions systems, the PCM also participates in controlling the powertrain (transmission) operation. Most PCMs also have the ability to communicate with other computers on the vehicle (ABS, ride control, body, etc.).
- **Monitor** - Monitors are "diagnostic routines" programmed into the PCM. The PCM utilizes these programs to run diagnostic tests, and to monitor operation of the vehicle's emissions-related components or systems to ensure they are operating correctly and within the vehicle's manufacturer specifications. Currently, up to fifteen Monitors are used in OBD2 systems. Additional Monitors will be added as the OBD2 system is further developed.

Not all vehicles support all fifteen Monitors.

- **Enabling Criteria** - Each Monitor is designed to test and monitor the operation of a specific part of the vehicle's emissions system (EGR system, oxygen sensor, catalytic converter, etc.). A specific set of "conditions" or "driving procedures" must be met before the computer can command a Monitor to run tests on its related system. These "conditions" are known as "**Enabling Criteria**." The requirements and procedures vary for each Monitor. Some Monitors only require the ignition key to be turned "**On**" for them to run and complete their diagnostic testing. Others may require a set of complex procedures, such as, starting the vehicle when cold, bringing it to operating temperature, and driving the vehicle under specific conditions before the Monitor can run and complete its diagnostic testing.
- **Monitor Has/Has Not Run** - The terms "Monitor has run" or "Monitor has not run" are used throughout this manual. "**Monitor <u>has</u> run**," means the PCM **has** commanded a particular Monitor to perform the required diagnostic testing on a system to ensure the system is operating correctly (within factory specifications). The term "**Monitor <u>has not</u> run**" means the PCM **has not** yet commanded a particular Monitor to perform diagnostic testing on its associated part of the emissions system.
- **Trip** - A Trip for a particular Monitor requires that the vehicle is being driven in such a way that all the required "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met. The "Trip Drive Cycle" for a particular Monitor begins when the ignition key is turned "**On**." It is successfully completed when all the "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met by the time the ignition key is turned "**Off**." Since each of the eleven monitors is designed to run diagnostics and testing on a different part of the engine or emissions system, the "Trip Drive Cycle" needed for each individual Monitor to run and complete varies.

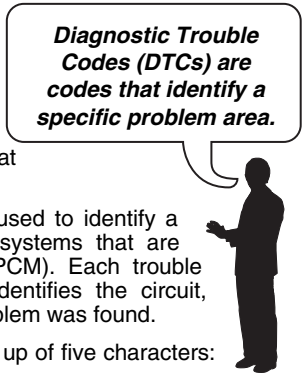
- **OBD2 Drive Cycle** - An OBD2 Drive Cycle is an extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life. These conditions may include starting the vehicle when it is cold, driving the vehicle at a steady speed (cruising), accelerating, etc. An OBD2 Drive Cycle begins when the ignition key is turned "On" (when cold) and ends when the vehicle has been driven in such a way as to have all the "Enabling Criteria" met for all its applicable Monitors. Only those trips that provide the Enabling Criteria for all Monitors applicable to the vehicle to run and complete their individual diagnostic tests qualify as an OBD2 Drive Cycle. OBD2 Drive Cycle requirements vary from one model of vehicle to another. Vehicle manufacturers set these procedures. Consult your vehicle's service manual for OBD2 Drive Cycle procedures.

Do not confuse a "Trip" Drive Cycle with an OBD2 Drive Cycle. A "Trip" Drive Cycle provides the "Enabling Criteria" for one specific Monitor to run and complete its diagnostic testing. An OBD2 Drive Cycle must meet the "Enabling Criteria" for all Monitors on a particular vehicle to run and complete their diagnostic testing.

- **Warm-up Cycle** - Vehicle operation after an engine off period where engine temperature rises at least 40°F (22°C) from its temperature before starting, and reaches at least 160°F (70°C). The PCM uses warm-up cycles as a counter to automatically erase a specific code and related data from its memory. When no faults related to the original problem are detected within a specified number of warm-up cycles, the code is erased automatically.

DIAGNOSTIC TROUBLE CODES (DTCs)

Diagnostic Trouble Codes (DTCs) are meant to guide you to the proper service procedure in the vehicle's service manual. **DO NOT** replace parts based only on DTCs without first consulting the vehicle's service manual for proper testing procedures for that particular system, circuit or component.



DTCs are alphanumeric codes that are used to identify a problem that is present in any of the systems that are monitored by the on-board computer (PCM). Each trouble code has an assigned message that identifies the circuit, component or system area where the problem was found.

OBD2 diagnostic trouble codes are made up of five characters:

- The 1st character is a **letter**. It identifies the "main system" where the fault occurred (Body, Chassis, Powertrain, or Network).
- The 2nd character is a **numeric digit**. It identifies the "type" of code (Generic or Manufacturer-Specific).

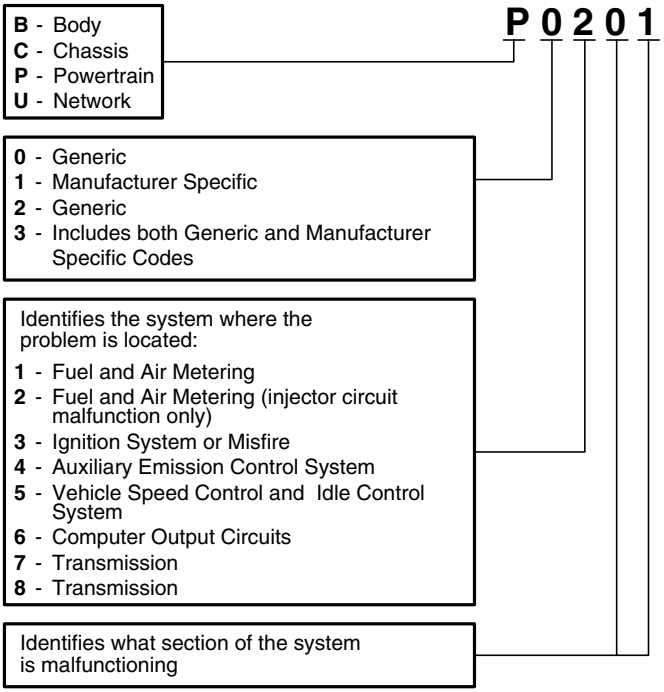
Generic DTCs *are codes that are used by all vehicle manufacturers. The standards for generic DTCs, as well as their definitions, are set by the Society of Automotive Engineers (SAE).*

Manufacturer-Specific DTCs *are codes that are controlled by the vehicle manufacturers. The Federal Government does not require vehicle manufacturers to go beyond the standardized generic DTCs in order to comply with the new OBD2 emissions standards. However, manufacturers are free to expand beyond the standardized codes to make their systems easier to diagnose.*

- The 3rd character is a **numeric digit**. It identifies the specific system or sub-system where the problem is located.
- The 4th and 5th characters are **numeric digits**. They identify the section of the system that is malfunctioning.

OBD2 DTC EXAMPLE

P0201 - Injector Circuit Malfunction, Cylinder 1


P 0 2 0 1
B - Body
C - Chassis
P - Powertrain
U - Network
0 - Generic
1 - Manufacturer Specific
2 - Generic
3 - Includes both Generic and Manufacturer Specific Codes
Identifies the system where the problem is located:
1 - Fuel and Air Metering
2 - Fuel and Air Metering (injector circuit malfunction only)
3 - Ignition System or Misfire
4 - Auxiliary Emission Control System
5 - Vehicle Speed Control and Idle Control System
6 - Computer Output Circuits
7 - Transmission
8 - Transmission
Identifies what section of the system is malfunctioning

DTCs and MIL Status

When the vehicle's on-board computer detects a failure in an emissions-related component or system, the computer's internal diagnostic program assigns a diagnostic trouble code (DTC) that points to the system (and subsystem) where the fault was found. The diagnostic program saves the code in the computer's memory. It records a "Freeze Frame" of conditions present when the fault was found, and lights the Malfunction Indicator Lamp (MIL). Some faults require detection for two trips in a row before the MIL is turned on.

The "Malfunction Indicator Lamp" (MIL) is the accepted term used to describe the lamp on the dashboard that lights to warn the driver that an emissions-related fault has been found. Some manufacturers may still call this lamp a "Check Engine" or "Service Engine Soon" light.

There are two types of DTCs used for emissions-related faults: Type "A" and Type "B." Type "A" codes are "One-Trip" codes; Type "B" DTCs are usually Two-Trip DTCs.

When a **Type "A"** DTC is found on the First Trip, the following events take place:

- The computer commands the MIL "On" when the failure is first found.
- If the failure causes a severe misfire that may cause damage to the catalytic converter, the MIL "flashes" **once per second**. The MIL continues to flash as long as the condition exists. If the condition that caused the MIL to flash is no longer present, the MIL will light "steady" On.
- A DTC is saved in the computer's memory for later retrieval.
- A "Freeze Frame" of the conditions present in the engine or emissions system when the MIL was ordered "On" is saved in the computer's memory for later retrieval. This information shows fuel system status (closed loop or open loop), engine load, coolant temperature, fuel trim value, MAP vacuum, engine RPM and DTC priority.

When a **Type "B"** DTC is found on the First Trip, the following events take place:

- The computer sets a Pending DTC, but the MIL is not ordered "On." "Freeze Frame" data may or may not be saved at this time depending on manufacturer. The Pending DTC is saved in the computer's memory for later retrieval.
- If the failure **is found** on the second consecutive trip, the MIL is ordered "On." "Freeze Frame" data is saved in the computer's memory.
- If the failure **is not found** on the second Trip, the Pending DTC is erased from the computer's memory.

The MIL will stay lit for both Type "A" and Type "B" codes until one of the following conditions occurs:

- If the conditions that caused the MIL to light are no longer present for the next three trips in a row, the computer automatically turns the MIL "Off" if no other emissions-related faults are present. However, the DTCs remain in the computer's memory as a history code for 40 warm-up cycles (80 warm-up cycles for fuel and misfire faults). The DTCs are automatically erased if the fault that caused them to be set is not detected again during that period.
- Misfire and fuel system faults require three trips with "similar conditions" before the MIL is turned "Off." These are trips where the engine load, RPM and temperature are similar to the conditions present when the fault was first found.

After the MIL has been turned off, DTCs and Freeze Frame data stay in the computer's memory.

- Erasing the DTCs from the computer's memory can also turn off the MIL. See ERASING DIAGNOSTIC TROUBLE CODES (DTCs) on page 49, before erasing codes from the computer's memory. If a Diagnostic Tool or Scan Tool is used to erase the codes, Freeze Frame data will also be erased.

OBD2 MONITORS

To ensure the correct operation of the various emissions-related components and systems, a diagnostic program was developed and installed in the vehicle's on-board computer. The program has several procedures and diagnostic strategies. Each procedure or diagnostic strategy is made to monitor the operation of, and run diagnostic tests on, a specific emissions-related component or system. These tests ensure the system is running correctly and is within the manufacturer's specifications. On OBD2 systems, these procedures and diagnostic strategies are called "Monitors."

Currently, fifteen Monitors are supported by OBD2 systems. Additional monitors may be added as a result of Government regulations as the OBD2 system grows and matures. Not all vehicles support all fifteen Monitors. Additionally, some Monitors are supported by "spark ignition" vehicles only, while others are supported by "compression ignition" vehicles only.

Monitor operation is either "**Continuous**" or "**Non-Continuous**," depending on the specific monitor.

Continuous Monitors

Three of these Monitors are designed to constantly monitor their associated components and/or systems for proper operation. Continuous Monitors run constantly when the engine is running. The Continuous Monitors are:

- Comprehensive Component Monitor (CCM)
- Misfire Monitor
- Fuel System Monitor

Non-Continuous Monitors

The other twelve Monitors are “non-continuous” Monitors. “Non-continuous” Monitors perform and complete their testing once per trip. The “non-continuous” Monitors are:

- O Oxygen Sensor Monitor
- OH Oxygen Sensor Heater Monitor
- C Catalyst Monitor
- HC Heated Catalyst Monitor
- E EGR System Monitor
- EV EVAP System Monitor
- 2A Secondary Air System Monitor

The following Monitors became standard beginning in 2010. The majority of vehicles produced before this time will not support these Monitors

- NM NMHC Monitor
- N NOx Adsorber Monitor
- BP Boost Pressure System Monitor
- EG Exhaust Gas Sensor Monitor
- P PM Filter Monitor

The following provides a brief explanation of the function of each Monitor:

CC **Comprehensive Component Monitor (CCM)** - This Monitor continuously checks all inputs and outputs from sensors, actuators, switches and other devices that provide a signal to the computer. The Monitor checks for shorts, opens, out of range value, functionality and “rationality.”

Rationality: Each input signal is compared against all other inputs and against information in the computer’s memory to see if it makes sense under the current operating conditions. Example: The signal from the throttle position sensor indicates the vehicle is in a wide-open throttle condition, but the vehicle is really at idle, and the idle condition is confirmed by the signals from all other sensors. Based on the input data, the computer determines that the signal from the throttle position sensor is not rational (does not make sense when compared to the other inputs). In this case, the signal would fail the rationality test.

The CCM is supported by both “spark ignition” vehicles and “compression ignition” vehicles. The CCM may be either a “One-Trip” or a “Two-Trip” Monitor, depending on the component.

F **Fuel System Monitor** - This Monitor uses a Fuel System Correction program, called Fuel Trim, inside the on-board computer. Fuel Trim is a set of positive and negative values that represent adding or subtracting fuel from the engine. This program is used to correct for a lean (too much air/not enough fuel) or rich (too much fuel/not enough air) air-fuel mixture. The program is designed to add or subtract fuel, as needed, up to a certain percent. If the correction needed is too large and exceeds the time and percent allowed by the program, a fault is indicated by the computer.

The Fuel System Monitor is supported by both “spark ignition” vehicles and “compression ignition” vehicles. The Fuel System Monitor may be a “One-Trip” or “Two-Trip” Monitor, depending on the severity of the problem.

M **Misfire Monitor** - This Monitor continuously checks for engine misfires. A misfire occurs when the air-fuel mixture in the cylinder does not ignite. The misfire Monitor uses changes in crankshaft speed to sense an engine misfire. When a cylinder misfires, it no longer contributes to the speed of the engine, and engine speed decreases each time the affected cylinder(s) misfire. The misfire Monitor is designed to sense engine speed fluctuations and determine from which cylinder(s) the misfire is coming, as well as how bad the misfire is. There are three types of engine misfires, Types 1, 2, and 3.

- Type 1 and Type 3 misfires are two-trip monitor faults. If a fault is sensed on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The MIL is not commanded on at this time. If the fault is found again on the second trip, under similar conditions of engine speed, load and temperature, the computer commands the MIL “On,” and the code is saved in its long term memory.
- Type 2 misfires are the most severe type of misfire. When a Type 2 misfire is sensed on the first trip, the computer commands the MIL to light when the misfire is sensed. If the computer determines that a Type 2 misfire is severe , and may cause catalytic converter damage, it commands the MIL to “flash” once per second as soon as the misfire is sensed. When the misfire is no longer present, the MIL reverts to steady “On” condition.

The Misfire Monitor is supported by both “spark ignition” vehicles and “compression ignition” vehicles.

C **Catalyst Monitor** - The catalytic converter is a device that is installed downstream of the exhaust manifold. It helps to oxidize (burn) the unburned fuel (hydrocarbons) and partially burned fuel (carbon monoxide) left over from the combustion process. To accomplish this, heat and catalyst materials inside the converter react with the exhaust gases to burn the remaining fuel. Some materials inside the catalytic converter also have the ability to store oxygen, and release it as needed to oxidize hydrocarbons and carbon monoxide. In the process, it reduces vehicle emissions by converting the polluting gases into carbon dioxide and water.

The computer checks the efficiency of the catalytic converter by monitoring the oxygen sensors used by the system. One sensor is located before (upstream of) the converter; the other is located after (downstream of) the converter. If the catalytic converter loses its ability to store oxygen,

the downstream sensor signal voltage becomes almost the same as the upstream sensor signal. In this case, the monitor fails the test.

The Catalyst Monitor is supported by "spark ignition" vehicles only. The Catalyst Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On" and saves the code in its long-term memory.

HC **Heated Catalyst Monitor** - Operation of the "heated" catalytic converter is similar to the catalytic converter. The main difference is that a heater is added to bring the catalytic converter to its operating temperature more quickly. This helps reduce emissions by reducing the converter's down time when the engine is cold. The Heated Catalyst Monitor performs the same diagnostic tests as the catalyst Monitor, and also tests the catalytic converter's heater for proper operation.

The Heated Catalyst Monitor is supported by "spark ignition" vehicles only. This Monitor is also a "Two-Trip" Monitor.

E **Exhaust Gas Recirculation (EGR) Monitor** - The Exhaust Gas Recirculation (EGR) system helps reduce the formation of Oxides of Nitrogen during combustion. Temperatures above 2500°F cause nitrogen and oxygen to combine and form Oxides of Nitrogen in the combustion chamber. To reduce the formation of Oxides of Nitrogen, combustion temperatures must be kept below 2500°F. The EGR system recirculates small amounts of exhaust gas back into the intake manifold, where it is mixed with the incoming air/fuel mixture. This reduces combustion temperatures by up to 500°F. The computer determines when, for how long, and how much exhaust gas is recirculated back to the intake manifold. The EGR Monitor performs EGR system function tests at preset times during vehicle operation.

The EGR Monitor is supported by both "spark ignition" vehicles and "compression ignition" vehicles. The EGR Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

EV **Evaporative System (EVAP) Monitor** - OBD2 vehicles are equipped with a fuel Evaporative system (EVAP) that helps prevent fuel vapors from evaporating into the air. The EVAP system carries fumes from the fuel tank to the engine where they are burned during combustion. The EVAP system may consist of a charcoal canister, fuel tank cap, purge solenoid, vent solenoid, flow monitor, leak detector and connecting tubes, lines and hoses.

Fumes are carried from the fuel tank to the charcoal canister by hoses or tubes. The fumes are stored in the charcoal canister. The computer controls the flow of fuel vapors from the charcoal canister to the engine via a purge solenoid. The computer energizes or de-energizes the purge solenoid (depending on solenoid design). The purge solenoid opens a valve to allow engine vacuum to draw the fuel vapors from the canister

into the engine where the vapors are burned. The EVAP Monitor checks for proper fuel vapor flow to the engine, and pressurizes the system to test for leaks. The computer runs this Monitor once per trip.

The EVAP Monitor is supported by "spark ignition" vehicles only. The EVAP Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the PCM commands the MIL "On," and saves the code in its long-term memory.

Oxygen Sensor Heater Monitor - The Oxygen Sensor Heater Monitor tests the operation of the oxygen sensor's heater. There are two modes of operation on a computer-controlled vehicle: "open-loop" and "closed-loop." The vehicle operates in open-loop when the engine is cold, before it reaches normal operating temperature. The vehicle also goes to open-loop mode at other times, such as heavy load and full throttle conditions. When the vehicle is running in open-loop, the oxygen sensor signal is ignored by the computer for air/fuel mixture corrections. Engine efficiency during open-loop operation is very low, and results in the production of more vehicle emissions.

Closed-loop operation is the best condition for both vehicle emissions and vehicle operation. When the vehicle is operating in closed-loop, the computer uses the oxygen sensor signal for air/fuel mixture corrections.

In order for the computer to enter closed-loop operation, the oxygen sensor must reach a temperature of at least 600°F. The oxygen sensor heater helps the oxygen sensor reach and maintain its minimum operating temperature (600°F) more quickly, to bring the vehicle into closed-loop operation as soon as possible.

The Oxygen Sensor Heater Monitor is supported by "spark ignition" vehicles only. The Oxygen Sensor Heater Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

Oxygen Sensor Monitor - The Oxygen Sensor monitors how much oxygen is in the vehicle's exhaust. It generates a varying voltage of up to one volt, based on how much oxygen is in the exhaust gas, and sends the signal to the computer. The computer uses this signal to make corrections to the air/fuel mixture. If the exhaust gas has a large amount of oxygen (a lean air/fuel mixture), the oxygen sensor generates a "low" voltage signal. If the exhaust gas has very little oxygen (a rich mixture condition), the oxygen sensor generates a "high" voltage signal. A 450mV signal indicates the most efficient, and least polluting, air/fuel ratio of 14.7 parts of air to one part of fuel.

The oxygen sensor must reach a temperature of at least 600-650°F, and the engine must reach normal operating temperature, for the computer to enter into closed-loop operation. The oxygen sensor only functions when the computer is in closed-loop. A properly operating oxygen sensor reacts quickly to any change in oxygen content in the

exhaust stream. A faulty oxygen sensor reacts slowly, or its voltage signal is weak or missing.

The Oxygen Sensor Monitor is supported by “spark ignition” vehicles only. The Oxygen Sensor Monitor is a “Two-Trip” monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

2A **Secondary Air System Monitor** - When a cold engine is first started, it runs in open-loop mode. During open-loop operation, the engine usually runs rich. A vehicle running rich wastes fuel and creates increased emissions, such as carbon monoxide and some hydrocarbons. A Secondary Air System injects air into the exhaust stream to aid catalytic converter operation:

1. It supplies the catalytic converter with the oxygen it needs to oxidize the carbon monoxide and hydrocarbons left over from the combustion process during engine warm-up.
2. The extra oxygen injected into the exhaust stream also helps the catalytic converter reach operating temperature more quickly during warm-up periods. The catalytic converter must heat to operating temperature to work properly.

The Secondary Air System Monitor checks for component integrity and system operation, and tests for faults in the system. The computer runs this Monitor once per trip.

The Secondary Air System Monitor is a “Two-Trip” monitor. If a fault is found on the first trip, the computer temporarily saves this fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

NM **Non-Methane Hydrocarbon Catalyst** (**NMHC) Monitor** - The non-methane hydrocarbon catalyst is a type of catalytic converter. It helps to remove non-methane hydrocarbons (NMH) left over from the combustion process from the exhaust stream. To accomplish this, heat and catalyst materials react with the exhaust gases to convert NMH to less harmful compounds. The computer checks the efficiency of the catalyst by monitoring the quantity of NMH in the exhaust stream. The monitor also verifies that sufficient temperature is present to aid in particulate matter (PM) filter regeneration.

The NMHC Monitor is supported by “compression ignition” vehicles only. The NMHC Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

N **NOx Aftertreatment Monitor** - NOx aftertreatment is based on a catalytic converter support that has been coated with a special washcoat containing zeolites. NOx Aftertreatment is designed to reduce oxides of nitrogen emitted in the exhaust stream. The zeolite acts as a molecular "sponge" to trap the NO and NO2 molecules in the exhaust stream. In some implementations, injection of a reactant before the aftertreatment purges it. NO2 in particular is unstable, and will join with hydrocarbons to produce H2O and N2. The NOx Aftertreatment Monitor monitors the function of the NOx aftertreatment to ensure that tailpipe emissions remain within acceptable limits.

The NOx Aftertreatment Monitor is supported by “compression ignition” vehicles only. The NOx Aftertreatment Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

BP **Boost Pressure System Monitor** - The boost pressure system serves to increase the pressure produced inside the intake manifold to a level greater than atmospheric pressure. This increase in pressure helps to ensure compete combustion of the air-fuel mixture. The Boost Pressure System Monitor checks for component integrity and system operation, and tests for faults in the system. The computer runs this Monitor once per trip.

The Boost Pressure System Monitor is supported by “compression ignition” vehicles only. The Boost Pressure System Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

EG **Exhaust Gas Sensor Monitor** - The exhaust gas sensor is used by a number of systems/monitors to determine the content of the exhaust stream. The computer checks for component integrity, system operation, and tests for faults in the system, as well as feedback faults that may affect other emission control systems.

The Exhaust Gas Sensor Monitor is supported by “compression ignition” vehicles only. The Exhaust Gas Sensor Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

PM Filter Monitor - The particulate matter (PM) filter removes particulate matter from the exhaust stream by filtration. The filter has a honeycomb structure similar to a catalyst substrate, but with the channels blocked at alternate ends. This forces the exhaust gas to flow through the walls between the channels, filtering the particulate matter out. The filters are self-cleaning by periodic modification of the exhaust gas concentration in order to burn off the trapped particles (oxidizing the particles to form CO2 and water). The computer monitors the efficiency of the filter in trapping particulate matter, as well as the ability of the filter to regenerate (self-clean).

The PM Filter Monitor is supported by “compression ignition” vehicles only. The PM Filter Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

OBD2 Reference Table

The table below lists current OBD2 Monitors, and indicates the following for each Monitor:

A. Monitor Type (how often does the Monitor run; Continuous or Once per trip)

B. Number of trips needed, with a fault present, to set a pending DTC

C. Number of consecutive trips needed, with a fault present, to command the MIL “On” and store a DTC

D. Number of trips needed, with no faults present, to erase a Pending DTC

E. Number and type of trips or drive cycles needed, with no faults present, to turn off the MIL

F. Number of warm-up periods needed to erase the DTC from the computer’s memory after the MIL is turned off

Name of Monitor	A	B	C	D	E	F
Comprehensive Component Monitor	Continuous	1	2	1	3	40
Misfire Monitor (Type 1 and 3)	Continuous	1	2	1	3 - similar conditions	80
Misfire Monitor (Type 2)	Continuous		1		3 - similar conditions	80
Fuel System Monitor	Continuous	1	1 or 2	1	3 - similar conditions	80
Catalytic Converter Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Heater Monitor	Once per trip	1	2	1	3 trips	40
Exhaust Gas Recirculation (EGR) Monitor	Once per trip	1	2	1	3 trips	40
Evaporative Emissions Controls Monitor	Once per trip	1	2	1	3 trips	40
Secondary Air System (AIR) Monitor	Once per trip	1	2	1	3 trips	40
NMHC Monitor	Once per trip	1	2	1	3 trips	40
NOx Adsorber Monitor	Once per trip	1	2	1	3 trips	40
Boost Pressure System Monitor	Once per trip	1	2	1	3 trips	40
Exhaust Gas Sensor Monitor	Once per trip	1	2	1	3 trips	40
PM Filter Monitor	Once per trip	1	2	1	3 trips	40

PRELIMINARY VEHICLE DIAGNOSTIC WORKSHEET

The purpose of this form is to help you gather preliminary information on your vehicle before you retrieve codes. By having a complete account of your vehicle's current problem(s), you will be able to systematically pinpoint the problem(s) by comparing your answers to the fault codes you retrieve. You can also provide this information to your mechanic to assist in diagnosis and help avoid costly and unnecessary repairs. It is important for you to complete this form to help you and/or your mechanic have a clear understanding of your vehicle's problems.

NAME:

DATE:

VIN*:

YEAR:

MAKE:

MODEL:

ENGINE SIZE:

VEHICLE MILEAGE:

*VIN: Vehicle Identification Number, found at the base of the windshield on a metallic plate, or at the driver door latch area (consult your vehicle owner's manual for location).

TRANSMISSION:

- ☐ Automatic
- ☐ Manual

Please check all applicable items in each category.

DESCRIBE THE PROBLEM:

WHEN DID YOU FIRST NOTICE THE PROBLEM:

- ☐ Just Started
- ☐ Started Last Week
- ☐ Started Last Month
- ☐ Other:

LIST ANY REPAIRS DONE IN THE PAST SIX MONTHS:

PROBLEMS STARTING

- ☐ No symptoms
- ☐ Will not crank
- ☐ Cranks, but will not start
- ☐ Starts, but takes a long time

ENGINE QUITS OR STALLS

- ☐ No symptoms
- ☐ Right after starting
- ☐ When shifting into gear
- ☐ During steady-speed driving
- ☐ Right after vehicle comes to a stop
- ☐ While idling
- ☐ During acceleration
- ☐ When parking

IDLING CONDITIONS

- ☐ No symptoms
- ☐ Is too slow at all times
- ☐ Is too fast
- ☐ Is sometimes too fast or too slow
- ☐ Is rough or uneven
- ☐ Fluctuates up and down

RUNNING CONDITIONS

- ☐ No symptoms
- ☐ Runs rough
- ☐ Lacks power
- ☐ Bucks and jerks
- ☐ Poor fuel economy
- ☐ Hesitates or stumbles on accelerations
- ☐ Backfires
- ☐ Misfires or cuts out
- ☐ Engine knocks, pings or rattles
- ☐ Surges
- ☐ Dieseling or run-on

AUTOMATIC TRANSMISSION PROBLEMS (if applicable)

- ☐ No symptoms
- ☐ Shifts too early or too late
- ☐ Changes gear incorrectly
- ☐ Vehicle does not move when in gear
- ☐ Jerks or bucks

PROBLEM OCCURS

- ☐ Morning
- ☐ Afternoon
- ☐ Anytime

ENGINE TEMPERATURE WHEN PROBLEM OCCURS

- ☐ Cold
- ☐ Warm
- ☐ Hot

DRIVING CONDITIONS WHEN PROBLEM OCCURS

- ☐ Short - less than 2 miles
- ☐ 2 - 10 miles
- ☐ Long - more than 10 miles
- ☐ Stop and go
- ☐ While turning
- ☐ While braking
- ☐ At gear engagement
- ☐ With A/C operating
- ☐ With headlights on
- ☐ During acceleration
- ☐ Mostly driving downhill
- ☐ Mostly driving uphill
- ☐ Mostly driving level
- ☐ Mostly driving curvy roads
- ☐ Mostly driving rough roads

DRIVING HABITS

- ☐ Mostly city driving
- ☐ Highway
- ☐ Park vehicle inside
- ☐ Park vehicle outside
- ☐ Drive less than 10 miles per day
- ☐ Drive 10 to 50 miles per day
- ☐ Drive more than 50 miles per day

GASOLINE USED

- ☐ 87 Octane
- ☐ 89 Octane
- ☐ 91 Octane
- ☐ More than 91 Octane

WEATHER CONDITIONS WHEN PROBLEM OCCURS

- ☐ 32 - 55° F (0 - 13° C)
- ☐ Above 55° F (13° C)
- ☐ Below freezing (32° F / 0° C)

CHECK ENGINE LIGHT / DASH WARNING LIGHT

- ☐ Sometimes ON
- ☐ Always ON
- ☐ Never ON

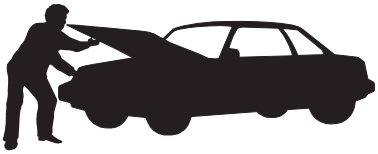
PECULIAR SMELLS

- ☐ "Hot"
- ☐ Sulfur ("rotten egg")
- ☐ Burning rubber
- ☐ Gasoline
- ☐ Burning oil
- ☐ Electrical

STRANGE NOISES

- ☐ Rattle
- ☐ Knock
- ☐ Squeak
- ☐ Other

BEFORE YOU BEGIN



The Enhanced CanOBD2 Diagnostic Tool aids in monitoring electronic- and emissions-related faults in your vehicle and retrieving fault codes related to malfunctions in these systems. Mechanical problems such as low oil level or damaged hoses, wiring or electrical connectors can cause poor engine performance and may also cause a fault code to set. Fix any known mechanical problems before performing any test. See your vehicle's service manual or a mechanic for more information.

Check the following areas **before** starting any test:

- Check the engine oil, power steering fluid, transmission fluid (if applicable), engine coolant and other fluids for proper levels. Top off low fluid levels if needed.
- Make sure the air filter is clean and in good condition. Make sure all air filter ducts are properly connected. Check the air filter ducts for holes, rips or cracks.
- Make sure all engine belts are in good condition. Check for cracked, torn, brittle, loose or missing belts.
- Make sure mechanical linkages to engine sensors (throttle, gearshift position, transmission, etc.) are secure and properly connected. See your vehicle's service manual for locations.
- Check all rubber hoses (radiator) and steel hoses (vacuum/fuel) for leaks, cracks, blockage or other damage. Make sure all hoses are routed and connected properly.
- Make sure all spark plugs are clean and in good condition. Check for damaged, loose, disconnected or missing spark plug wires.
- Make sure the battery terminals are clean and tight. Check for corrosion or broken connections. Check for proper battery and charging system voltages.
- Check all electrical wiring and harnesses for proper connection. Make sure wire insulation is in good condition, and there are no bare wires.
- Make sure the engine is mechanically sound. If needed, perform a compression check, engine vacuum check, timing check (if applicable), etc.

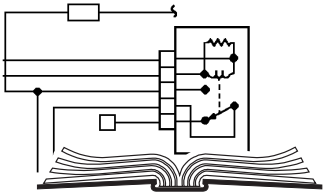
VEHICLE SERVICE MANUALS

Always refer to the manufacturer's service manual for your vehicle before performing any test or repair procedures. Contact your local car dealership, auto parts store or bookstore for availability of these manuals. The following companies publish valuable repair manuals:

- **Haynes Publications**
  861 Lawrence Drive
  Newbury Park, California 91320
  Phone: 800-442-9637
  Web: www.haynes.com

- **Mitchell 1**
  14145 Danielson Street
  Poway, California 92064
  Phone: 888-724-6742
  Web: www.m1products.com

- **Motor Publications**
  5600 Crooks Road, Suite 200
  Troy, Michigan 48098
  Phone: 800-426-6867
  Web: www.motor.com



FACTORY SOURCES

Ford, GM, Chrysler, Honda, Isuzu, Hyundai and Subaru Service Manuals

- **Helm Inc.**
  14310 Hamilton Avenue
  Highland Park, Michigan 48203
  Phone: 800-782-4356
  Web: www.helminc.com

CODE RETRIEVAL PROCEDURE

Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.

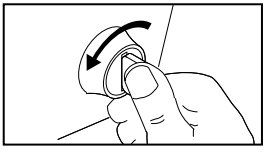
Never replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.

Check your vehicle thoroughly before performing any test. See BEFORE YOU BEGIN on page 31 for details.

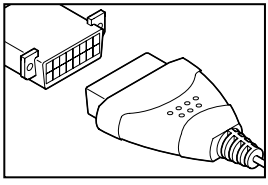
***ALWAYS** observe safety precautions whenever working on a vehicle. See SAFETY FIRST! on page 3 for more information.*

1. Turn the ignition off.

2. Locate the vehicle's 16-pin Data Link Connector (DLC). See page 5 for connector location.



Some DLCs have a plastic cover that must be removed before connecting the Diagnostic Tool cable connector.

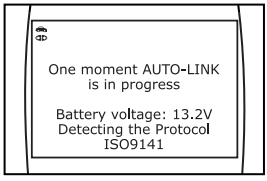


*If the Diagnostic Tool is ON, turn it OFF by pressing the **POWER/LINK** button BEFORE connecting the Diagnostic Tool to the DLC.*

3. Connect the Diagnostic Tool cable connector to the vehicle's DLC. The cable connector is keyed and will only fit one way.

- If you have problems connecting the cable connector to the DLC, rotate the connector 180° and try again.
- If you still have problems, check the DLC on the vehicle and on the Diagnostic Tool. Refer to your vehicle's service manual to properly check the vehicle's DLC.

4. When the Diagnostic Tool's cable connector is properly connected to the vehicle's DLC, the unit automatically turns ON, and links to the vehicle's on-board computer.



- If the unit does not power on automatically when connected to the vehicle's DLC connector, it usually indicates there is no power present at the vehicle's DLC connector. Check your fuse panel and replace any burned-out fuses.
- If replacing the fuse(s) does not correct the problem, consult your vehicle's repair manual to identify the proper computer (PCM) fuse/circuit, and perform any necessary repairs before proceeding.

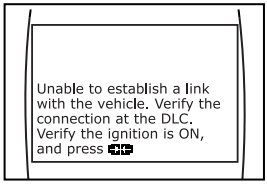
5. Turn the ignition on. **DO NOT** start the engine.

- The Diagnostic Tool will automatically start a check of the vehicle's computer to determine which type of communication protocol it is using. When the Diagnostic Tool identifies the computer's communication protocol, a communication link is established. The protocol type used by the vehicle's computer is shown on the LCD display.

A PROTOCOL is a set of rules and procedures for regulating data transmission between computers, and between testing equipment and computers. As of this writing, five different types of protocols (ISO 9141, Keyword 2000, J1850 PWM, J1850 VPW and CAN) are in use by vehicle manufacturers. The Diagnostic Tool automatically identifies the protocol type and establishes a communication link with the vehicle's computer.

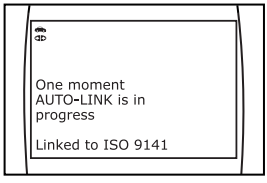
6. After approximately 10~60 seconds, the Diagnostic Tool will **retrieve** and **display** any Diagnostic Trouble Codes, Monitor Status and Freeze Frame Data retrieved from the vehicle's computer memory.

- If the Diagnostic Tool fails to link to the vehicle's computer a "Linking Failed" message shows on the Diagnostic Tool's LCD display.



  - Verify the connection at the DLC, and verify the ignition is ON.
  - Turn the ignition OFF, wait 5 seconds, then turn back ON to reset the computer.
  - Ensure your vehicle is OBD2 compliant. See VEHICLES COVERED on page 5 for vehicle compliance verification information.

- The Diagnostic Tool will automatically re-link to the vehicle's computer every 30 seconds to refresh the data being retrieved. When data is being refreshed, the message "One moment Auto – link in progress" is shown on the LCD display. This action repeats as long as the Diagnostic Tool is communicating with the vehicle's computer.

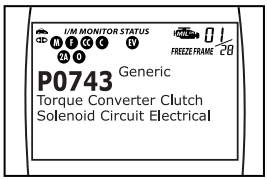


- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes (including "enhanced" codes) are present, a "No Powertrain DTCs or Freeze Frame Data is presently stored in the vehicle's computer" message is displayed.
- The Diagnostic Tool is capable of retrieving and storing up to 32 codes in memory, for immediate or later viewing.

7. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The I/M Monitor Status icons indicate the type and number of Monitors the vehicle supports, and provides indications of the current status of the vehicle's Monitors. A **solid** Monitor icon indicates the associated Monitor **has run** and completed its testing. A **blinking** Monitor icon indicates the associated Monitor **has not run** and completed its testing.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved, the type of code and whether or not the displayed code commanded the MIL on. If the code being displayed is a PENDING code, the PENDING icon is shown.



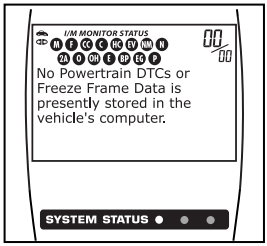
*Freeze Frame data is always associated with the "Priority Code" (identified as Code #1 in the Diagnostic Tool's display). If the **FREEZE FRAME** icon is lit when the "Priority Code" (Code #1) is displayed on the Diagnostic Tool's screen, it indicates that there is Freeze Frame data associated with this code, and the vehicle's computer has saved it in its memory.*

- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.

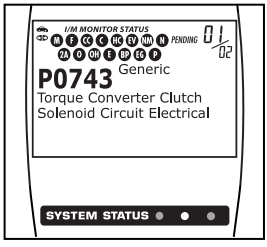
In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⊙ button to view the additional information.

8. Read and interpret Diagnostic Trouble Codes/system condition using the LCD display and the green, yellow and red LEDs.

The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions.

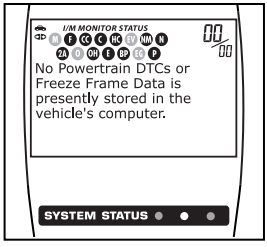


- **Green LED** – Indicates that all engine systems are "OK" and operating normally. All monitors supported by the vehicle have run and performed their diagnostic testing, and no trouble codes are present. A zero will show on the Diagnostic Tool's LCD display, and all Monitor icons will be solid.

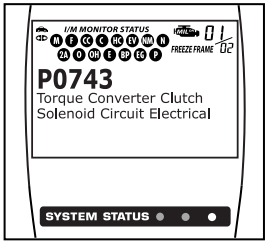


- **Yellow LED** – Indicates one of the following conditions:

  A. PENDING CODE IS PRESENT – If the yellow LED is illuminated, it may indicate a Pending code is present. Check the Diagnostic Tool's LCD display for confirmation. A Pending code is confirmed by the presence of a numeric code and the word PENDING on the Diagnostic Tool's LCD display.



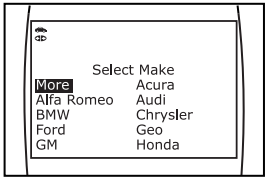
  B. MONITOR NOT RUN STATUS – If the Diagnostic Tool's LCD display shows a zero (indicating there are no DTC's present in the vehicle's computer memory), but the yellow LED is illuminated, it may be an indication that some of the Monitors supported by the vehicle have not yet run and completed their diagnostic testing. Check the Diagnostic Tool's LCD display for confirmation. All Monitor icons that are blinking have not yet run and completed their diagnostic testing; all Monitor icons that are solid have run and completed their diagnostic testing.



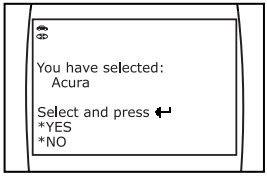
- **Red LED** – Indicates there is a problem with one or more of the vehicle's systems. The red LED is also used to indicate that DTC(s) are present (displayed on the Diagnostic Tool's screen). In this case, the Multifunction Indicator (Check Engine) lamp on the vehicle's instrument panel will be illuminated.

- **Flashing Red and Yellow LEDs** – Indicates that a "permanent" code has been set, and one or more of the vehicle's monitors has failed its diagnostic testing. A "permanent" DTC can be cleared *only* by the vehicle's computer following successful completion of the monitor that caused the fault to set.

- DTC's that start with "P0", "P2" and some "P3" are considered Generic (Universal). All Generic DTC definitions are the same on all OBD2 equipped vehicles. The Diagnostic Tool automatically displays the code definitions for Generic DTC's.
- DTC's that start with "P1" and some "P3" are Manufacturer Specific codes and their code definitions vary with each vehicle manufacturer. When a Manufacturer Specific DTC is retrieved, the LCD display shows a list of vehicle manufacturers. Use the **DOWN** ⊖ button to highlight the appropriate manufacturer, then press the **ENTER** ⊖ button to display the correct code definition for your vehicle. A confirmation message shows on the LCD display.

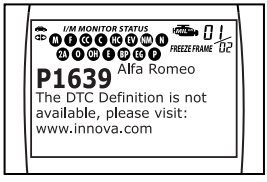


  - If the correct manufacturer is shown, use the **DOWN** ⊖ button to highlight **YES**, then press the **ENTER** ⊖ button to continue.
  - If the correct manufacturer is not shown, use the **DOWN** ⊖ button to highlight **NO**, then press the **ENTER** ⊖ button to return to the list of vehicle manufacturers.



*If the manufacturer for your vehicle is not listed, use the **DOWN** ⊖ button to select **More** and press the **ENTER** ⊖ button for additional manufacturers.*

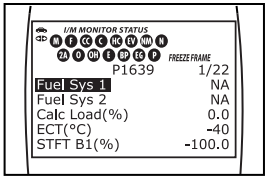
If the Manufacturer Specific definition for the currently displayed code is not available, an advisory message shows on the Diagnostic Tool's LCD display.



9. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.

- Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.
- Each time the **DTC** button is pressed and released, the Diagnostic Tool will scroll and display the next DTC in sequence until all DTCs in its memory have displayed.
- Freeze Frame Data (if available) will display after DTC #1.

- In OBD2 systems, when an emissions-related engine malfunction occurs that causes a DTC to set, a record or snapshot of engine conditions at the time that the malfunction occurred is also saved in the vehicle's computer memory. The record saved is called Freeze Frame data. Saved engine conditions include, but are not limited to: engine speed, open or closed loop operation, fuel system commands, coolant temperature, calculated load value, fuel pressure, vehicle speed, air flow rate, and intake manifold pressure.



*If more than one malfunction is present that causes more than one DTC to be set, only the code with the highest priority will contain Freeze Frame data. The code designated "**01**" on the Diagnostic Tool display is referred to as the PRIORITY code, and Freeze Frame data always refers to this code. The priority code is also the one that has commanded the MIL on.*

Retrieved information can be uploaded to a Personal Computer (PC) with the use of optional software (see instructions included with the software for more information).

10. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the display returns to the first DTC retrieved.

11. Determine engine system(s) condition by viewing the Diagnostic Tool's LCD display for any retrieved Diagnostic Trouble Codes, code definitions, Freeze Frame data and interpreting the green, yellow and red LEDs.

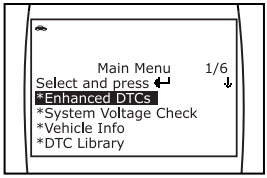
- If DTC's were retrieved and you are going to perform the repairs yourself, proceed by consulting the Vehicle's Service Repair Manual for testing instructions, testing procedures, and flow charts related to retrieved code(s).
- If you plan to take the vehicle to a professional to have it serviced, complete the PRELIMINARY VEHICLE DIAGNOSTIC WORKSHEET on page 28 and take it together with the retrieved codes, freeze frame data and LED information to aid in the troubleshooting procedure.
- To prolong battery life, the Diagnostic Tool automatically shuts "Off" approximately three minutes after it is disconnected from the vehicle. The DTCs retrieved, Monitor Status and Freeze Frame data (if any) will remain in the Diagnostic Tool's memory, and may be viewed at any time by turning the unit "On". If the Diagnostic Tool's batteries are removed, or if the Diagnostic Tool is re-linked to a vehicle to retrieve codes/data, any prior codes/data in its memory are automatically cleared.

VIEWING ENHANCED DTCs

The "enhanced" mode provides the ability to retrieve enhanced DTCs from most Chrysler/Jeep, Ford/Mazda, GM/Isuzu, Honda/Acura and Toyota/Lexus vehicles. The types of enhanced data available depends on the vehicle make. You can also retrieve Anti-Lock Brake System (ABS) DTCs.

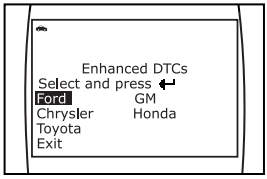
To view Enhanced DTCs:

1. With the Diagnostic Tool on the Code Retrieval screen, press and release the **M** (M) button.

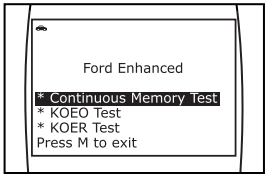
   

   - The Main Menu displays.
2. Use the **DOWN** (▼) button to highlight **Enhanced DTCs**, then press the **ENTER** (↵) button.
3. The screen shown when **Enhanced DTCs** is selected from the Main Menu depends on the type(s) of DTC(s) returned during the code retrieval process:

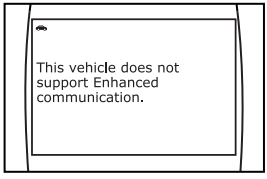
   - If *no* DTCs were retrieved, or *only* generic DTCs were retrieved, the Select Manufacturer screen displays. Use the **DOWN** (▼) button to highlight the appropriate manufacturer, then press the **ENTER** (↵) button to view the selected information.

   - If the Diagnostic Tool recognizes the vehicle make *or* if a Manufacturer specific DTC was retrieved, *and* the manufacturer selected for the code *was* Ford, the Select Data menu displays. Use the **DOWN** (▼) button to highlight the desired option, then press the **ENTER** (↵) button to view the selected information, or, press **M** (M) button to exit and return to the previous Menu.

   - If a Manufacturer specific DTC was retrieved, and the manufacturer selected for the code *was not* Chrysler, Jeep, Ford, Mazda, General Motors, Isuzu, Honda, Acura, Toyota or Lexus. An advisory message displays. Press the **M** (M) button to return to the previous menu. Enhanced data is not available for your vehicle.

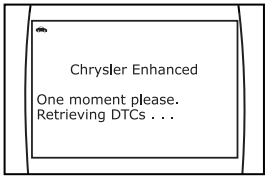
     

Refer to the appropriate paragraph to view enhanced DTCs for your vehicle:

- Chrysler/Jeep Enhanced DTCs .....page 40
- Ford/Mazda Enhanced DTCs .....page 41
- GM/Isuzu Enhanced DTCs .....page 43
- Honda/Acura Enhanced DTCs .....page 44
- Toyota/Lexus Enhanced DTCs.....page 46

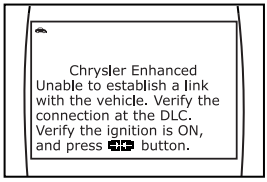
Chrysler/Jeep Enhanced DTCs

When the Diagnostic Tool enters the "enhanced" mode (and **Chrysler** is selected, if prompted), the Diagnostic Tool retrieves enhanced DTCs from the vehicle's computer.



1. A "One moment please" message displays while the Diagnostic Tool retrieves the selected DTCs.

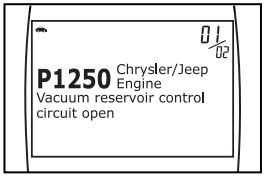
- If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.
  - Verify the ignition is ON, then press the **POWER/LINK** button to continue.


Chrysler Enhanced
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press button.

2. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

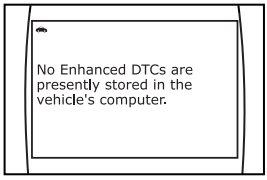
- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.



I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.

In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⊙ button to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** (M) button to return to the Chrysler Enhanced menu.



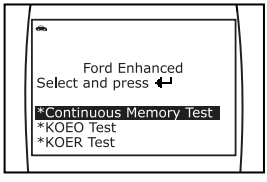
3. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.
   - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.
4. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the Chrysler Enhanced menu.
   - To view *additional* enhanced DTCs, repeat steps **1** through **4**, above.
   - To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

Ford/Mazda Enhanced DTCs

*Mazda Enhanced DTCs are available for **Mazda-branded Ford vehicles only.***

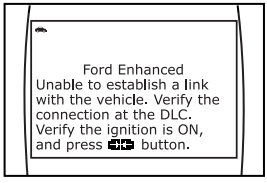
When the Diagnostic Tool enters the "enhanced" mode (and **Ford** is selected, if prompted), the Ford Enhanced menu displays. You may view DTCs for either the "Continuous Memory Test", "KOEO (Key On Engine Off) Test" or "KOER (Key On Engine Running) Test."

1. Use the **DOWN** (⌄) button to highlight the desired option, then press the **ENTER** (↵) button.

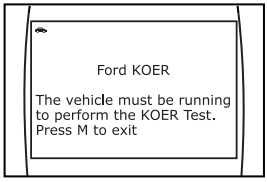


*When choosing to view **KOER Test** DTCs, start the vehicle's engine before making your selection.*

- If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.
  - Verify the ignition is ON, then press the **POWER/LINK** button to continue.

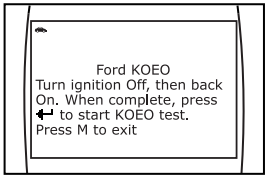

Ford Enhanced
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press button.

- If the KOER Test was selected, and the vehicle's engine *is not* running, an advisory message shows on the Diagnostic Tool's display.
  - Start the vehicle's engine, then press the **ENTER** ⏎ button to continue.

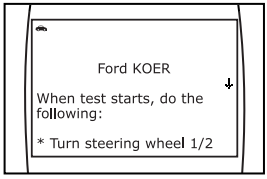


2. An "instructional" message shows on the Diagnostic Tool's display. Perform test procedures as appropriate.

- If the Continuous Memory or KOEO test was selected, turn the ignition OFF, then back ON. Press the **ENTER** ⏎ button to start the test.
  - A "One moment please" message displays while the test is in progress.



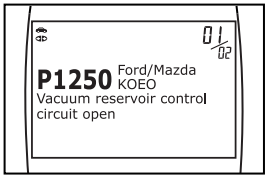
- If the KOER test was selected, press the **ENTER** ⏎ button to continue.
  - A "One moment please" message displays while the test is in progress.
  - Turn the steering wheel to the right, then release.
  - Press and release the brake pedal.
  - Cycle the overdrive switch (if equipped).



3. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

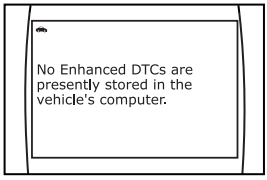
- A visible 🚗 icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible ⇔ icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.



I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.

In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⏎ button to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** (M) button to return to the Ford Enhanced menu.

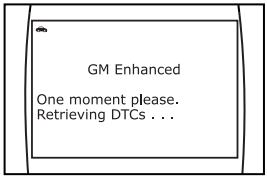


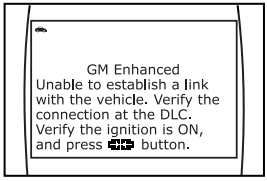
4. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.
   - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.
5. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the Ford Enhanced menu.
   - To view *additional* enhanced DTCs, repeat steps **1** through **4**, above.
   - To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

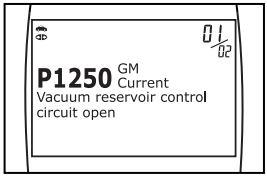
General Motors/Isuzu Enhanced DTCs

When the Diagnostic Tool enters the "enhanced" mode (and **GM** is selected, if prompted), the Diagnostic Tool retrieves enhanced DTCs from the vehicle's computer.

1. A "One moment please" message displays while the Diagnostic Tool retrieves the selected DTCs.
   - If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.
     - Verify the ignition is ON, then press the **POWER/LINK** button to continue.
2. To read the display:




GM Enhanced
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press button.



Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

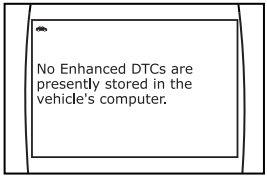
- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.

- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.

I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.

In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⊖ button to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** (M) button to return to the GM Enhanced menu.

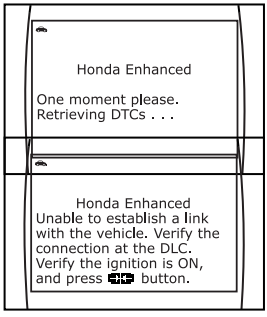


3. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.
   - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.
4. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the GM Enhanced menu.
   - To view *additional* enhanced DTCs, repeat steps **1** through **4**, above.
   - To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

Honda/Acura Enhanced DTCs

When the Diagnostic Tool enters the "enhanced" mode (and **Honda** is selected, if prompted), the Diagnostic Tool retrieves enhanced DTCs from the vehicle's computer.

1. A "One moment please" message displays while the Diagnostic Tool retrieves the selected DTCs.
   - If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.

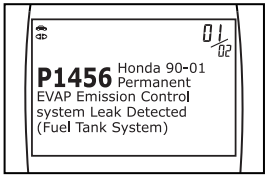

Honda Enhanced
One moment please.
Retrieving DTCs . . .
Honda Enhanced
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press button.

- Verify the ignition is ON, then press the **POWER/LINK** button to continue.

2. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

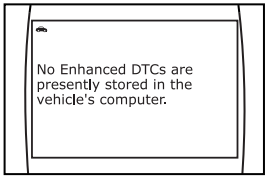
- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.



I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.

In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⊙ button to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** (M) button to return to the Honda Enhanced menu.



3. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.

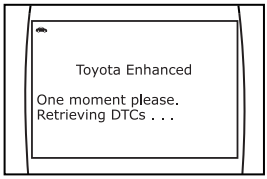
- Whenever the Scroll function is used to view additional codes, the Diagnostic Tool communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.

4. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the Honda Enhanced menu.

- To view *additional* enhanced DTCs, repeat steps **1** through **4**, above.
- To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

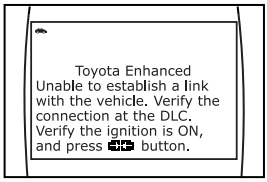
Toyota/Lexus Enhanced DTCs

When the Diagnostic Tool enters the "enhanced mode" (and **Toyota** is selected, if prompted), the Diagnostic Tool retrieves enhanced DTCs from the vehicle's computer.



1. A "One moment please" message displays, while the Diagnostic Tool retrieves the selected DTCs.

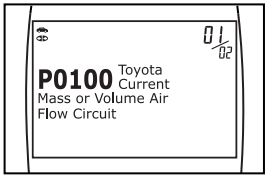
- If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's Display.
  - Verify the ignition is ON, then press the **POWER/LINK** button to continue.


Toyota Enhanced
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press button.

2. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

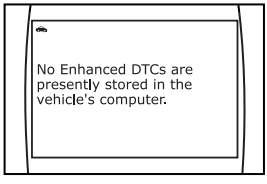
- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.



I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.

In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ⌄ button to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** (M) button to return to the Toyota Enhanced menu.



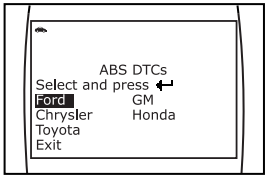
3. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.
   - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.
4. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the Toyota Enhanced menu.
   - To view *additional* enhanced DTCs, repeat steps **1** through **4**, above.
   - To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

VIEWING ABS DTCs

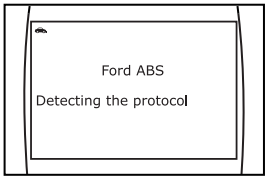
Refer to Vehicle Applications - ABS on page 71 for vehicles covered.

Reading ABS DTCs

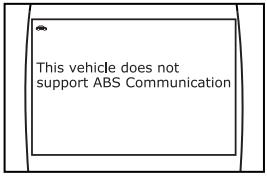
1. From the OBD2 DTC screen or Enhanced DTC screen, press the **ABS** button.
   - If *no* OBD2 DTCs were retrieved, or *only* generic DTCs were retrieved, the Select Manufacturer screen displays. Use the **DOWN** button to highlight the appropriate manufacturer, then press the **ENTER** button to continue, or, highlight **Exit** and press the **ENTER** button to return to the previous Menu.



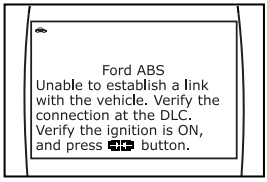
   - The Scan Tool will start a check of the vehicle's computer to determine which type of communication protocol it is using. When the Scan Tool identifies the computer's communication protocol, a communication link is established.



2. A "One moment please" message displays while the Diagnostic Tool retrieves the selected DTCs.
   - If the vehicle does not support ABS communication, an advisory message shows on the Diagnostic Tool's display. Press the **DTC** button to return to the previous display.



- If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.

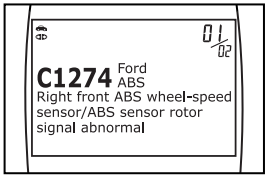

Ford ABS
Unable to establish a link with the vehicle. Verify the connection at the DLC. Verify the ignition is ON, and press ESC button.

  - Verify the connection at the DLC, and verify the ignition is ON.
  - Turn the ignition OFF, wait 5 seconds, then turn back ON to reset the computer.

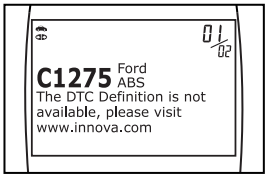
3. To read the display:

Refer to DISPLAY FUNCTIONS on page 9 for a description of LCD display elements.

- A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.



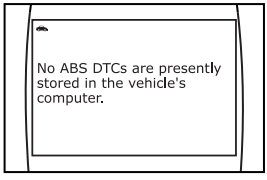
If the definition for the currently displayed code is not available, an advisory message shows on the Diagnostic Tool's display.



I/M MONITOR STATUS icons are not displayed when viewing ABS DTCs.

In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the ***DOWN*** *button to view the additional information.*

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No ABS DTC's are presently stored in the vehicle's computer" is displayed. Press the **M** button to return to the previous Menu.



4. If more than one code was retrieved press the **DTC** button, as necessary, to display additional codes one at a time.

- Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK** button again.

5. When the last retrieved DTC has been displayed and the **DTC** button is pressed, the Diagnostic Tool returns to the previous Menu.

- To exit the enhanced mode, press the **M** (M) button. The Diagnostic Tool returns to the OBD2 DTC screen.

ERASING DIAGNOSTIC TROUBLE CODES (DTCs)

When the Diagnostic Tool's ERASE function is used to erase DTCs from the vehicle's on-board computer, "Freeze Frame" data and manufacturer-specific-enhanced data are also erased. "Permanent" DTCs ARE NOT erased by the ERASE function.

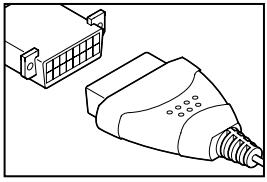
If you plan to take the vehicle to a Service Center for repair, **DO NOT** erase the codes from the vehicle's computer. If the codes are erased, valuable information that might help the technician troubleshoot the problem will also be erased.

Erase DTCs from the computer's memory as follows:

When DTCs are erased from the vehicle's computer memory, the I/M Readiness Monitor Status program resets the status of all Monitors to a not run "flashing" condition. To set all of the Monitors to a DONE status, an OBD2 Drive Cycle must be performed. Refer to your vehicle's service manual for information on how to perform an OBD2 Drive Cycle for the vehicle under test.

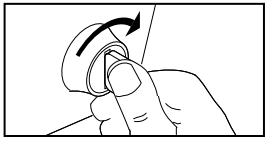
*The Diagnostic Tool must be connected to the vehicle's DLC to erase the codes from the computer's memory. If you press the **ERASE** button when the Diagnostic Tool is not connected to the vehicle's DLC, the erase instruction screen displays.*

1. If not connected already, connect the Diagnostic Tool to the vehicle's DLC, and turn the ignition "On." (If the Diagnostic Tool is already connected and linked to the vehicle's computer, proceed directly to step 3. If not, continue to step 2.)



2. Perform the Code Retrieval procedure as described on page 33.

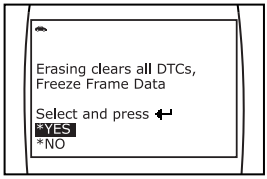
- **To erase OBD2 DTCs:** Wait until the codes are displayed on the Diagnostic Tool's LCD and then proceed to step 3.



- **To erase Enhanced or ABS DTCs:** Perform the Code Retrieval procedure for Enhanced DTCs as described on page 39 or for ABS DTCs as described on page 47. Wait until the codes are displayed on the Diagnostic Tool's LCD and then proceed to step 3.

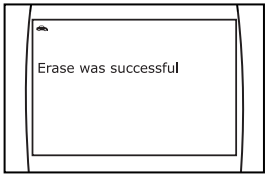
3. Press and release the **ERASE** button. A confirmation message shows on the LCD display.

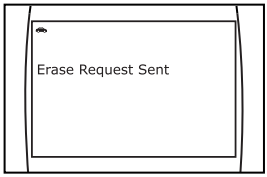
- If you are sure you want to proceed, use the **DOWN** button to highlight **YES**, then press the **ENTER** button.
  - If you do not want to continue with the erase process, use the **DOWN** button to highlight **NO**, then press the **ENTER** button.



4. If you chose to erase DTCs, a progress screen displays while the erase function is in progress.

- If the erase was successful, a confirmation message shows on the display. Press the **POWER/LINK** button to re-link the Tool to the vehicle.
- If the erase was not successful, an advisory message shows on the display indicating the erase request was sent to the vehicle's computer.





Erasing DTCs does not fix the problem(s) that caused the code(s) to be set. If proper repairs to correct the problem that caused the code(s) to be set are not made, the code(s) will appear again (and the check engine light will illuminate) as soon as the vehicle is driven long enough for its Monitors to complete their testing.

ABOUT REPAIRSOLUTIONS®

RepairSolutions® is a web-based service created to assist both the do-it-yourselfer and professional technicians in quickly and accurately diagnosing and repairing today's vehicles. RepairSolutions® allows you to view, save, and email the diagnostic data retrieved from a vehicle's on-board computer(s) using the Diagnostic Tool. RepairSolutions® also provides access to an extensive knowledge database including:

- **Verified Fixes** – Find the most likely fixes reported and verified by ASE Technicians for the retrieved DTCs.
- **Step-By-Step Repair Instructions** – View available repair instructions to properly perform the fix.
- **How-To-Repair Videos** – Watch repair video tutorials for valuable repair tips.

- **Technical Service Bulletins** – Research known problems reported by vehicle manufacturers.
- **Safety Recalls** – Research known safety concerns applicable to a vehicle.

And much more. Please visit www.innova.com for additional information.

Hardware Requirements:

- Diagnostic Tool
- Mini USB Cable (included with tool)

Minimum System Operating Requirements:

- Windows® PC System
- Windows® XP, Windows® Vista, or Windows® 7
- 128 MD Ram
- Pentium III Processor
- One available USB port
- Internet Connection
- Internet Explorer 5.5, Netscape 7.0 or Firefox 1.0 browser

Accessing RepairSolutions®

5. Link your Diagnostic Tool to a vehicle and retrieve diagnostic data (refer to CODE RETRIEVAL PROCEDURE on page 33 for details).
6. Connect the Diagnostic Tool to your PC using the USB cable provided.
   - Your default web browser launches automatically and connects to the www.innova.com website.
   - The Diagnostic Tool automatically downloads and installs the software necessary to support communication between the Diagnostic Tool and the website.
7. Login to your RepairSolutions® account using your registered **Email Address** and **Password**.

If you have not yet established an account, you must register for a FREE RepairSolutions® account before proceeding.

I/M READINESS TESTING

I/M is an Inspection and Maintenance program legislated by the Government to meet federal clean-air standards.

The program requires that a vehicle be taken periodically to an Emissions Station for an "Emissions Test" or "Smog Check," where the emissions-related components and systems are inspected and tested for proper operation. Emissions Tests are generally performed once a year, or once every two years.

On OBD2 systems, the I/M program is enhanced by requiring vehicles to meet stricter test standards. One of the tests instituted by the Federal Government is called I/M 240. On I/M 240, the vehicle under test is driven under different speeds and load conditions on a dynamometer for 240 seconds, while the vehicle's emissions are measured.

Emissions tests vary depending on the geographic or regional area in which the vehicle is registered. If the vehicle is registered in a highly urbanized area, the I/M 240 is probably the type of test required. If the vehicle is registered in a rural area, the stricter "dynamometer type" test may not be required.

I/M Readiness Monitors

I/M Readiness shows whether the various emissions-related systems on the vehicle are operating properly and are ready for Inspection and Maintenance testing.

State and Federal Governments enacted Regulations, Procedures and Emission Standards to ensure that all emissions-related components and systems are **continuously** or **periodically** monitored, tested and diagnosed whenever the vehicle is in operation. It also requires vehicle manufacturers to automatically detect and report any problems or faults that may increase the vehicle's emissions to an unacceptable level.

The vehicle's emissions control system consists of several components or sub-systems (Oxygen Sensor, Catalytic Converter, EGR, Fuel System, etc.) that aid in reducing vehicle emissions.

To have an efficient Vehicle Emission Control System, all the emissions-related components and systems must work correctly whenever the vehicle is in operation.

To comply with State and Federal Government regulations, vehicle manufacturers designed a series of special computer programs called "Monitors" that are programmed into the vehicle's computer. Each of these Monitors is specifically designed to run tests and diagnostics on a specific emissions-related component or system (Oxygen Sensor, Catalytic Converter, EGR Valve, Fuel System, etc.) to ensure their proper operation. Currently, there are a maximum of eleven Monitors available for use.

To learn more about Emissions Inspection and Maintenance (I/M) Readiness Monitors, see OBD2 MONITORS on page 23.

Each Monitor has a specific function to test and diagnose only its designated emissions-related component or system. The names of the Monitors (Oxygen Sensor Monitor, Catalyst Monitor, EGR Monitor, Misfire Monitor, etc.) describe which component or system each Monitor is designed to test and diagnose.

Emissions Inspection and Maintenance (I/M) Readiness

Monitor Status Information

I/M Readiness Monitor Status shows which of the vehicle's Monitors have run and completed their diagnosis and testing, and which ones have not yet run and completed testing and diagnosis of their designated sections of the vehicle's emissions system.

- If a Monitor was able to meet all the conditions required to enable it to perform the self-diagnosis and testing of its assigned engine system, it means the monitor "HAS RUN."
- If a Monitor has not yet met all the conditions required for it to perform the self-diagnosis and testing of its assigned engine system; it means the Monitor "HAS NOT RUN."

The Monitor Run/Not Run status does not show whether or not a problem exists in a system. Monitor status only indicates whether a particular Monitor has or has not run and performed the self-diagnosis and testing of its associated system.

Performing I/M Readiness Quick Check

When a vehicle first comes from the factory, all Monitors indicate a "HAVE RUN" status. This indicates that all Monitors have run and completed their diagnostic testing. The "HAVE RUN" status remains in the computer's memory, unless the Diagnostic Trouble Codes are erased or the vehicle's computer memory is cleared.

The Diagnostic Tool allows you to retrieve Monitor/System Status Information to help you determine if the vehicle is ready for an Emissions Test (Smog Check). In addition to retrieving Diagnostic Trouble Codes, the Diagnostic Tool also retrieves Monitor Run/Not Run status. This information is very important since different areas of the state/country have different emissions laws and regulations concerning Monitor Run/Not Run status.

Before an Emissions Test (Smog Check) can be performed, your vehicle must meet certain rules, requirements and procedures legislated by the Federal and state (country) governments where you live.

1. In most areas, one of the requirements that must be met before a vehicle is allowed to be Emissions Tested (Smog Checked) is that the vehicle does not have any Diagnostic Trouble Codes present (with the exception of PENDING Diagnostic Trouble Codes).
2. In addition to the requirement that no Diagnostic Trouble Codes be present, some areas also require that all the Monitors that a particular vehicle supports indicate a "Has Run" status condition before an Emissions Check may be performed.
3. Other areas may only require that some (but not all) Monitors indicate a "Has Run" status before an Emissions Test (Smog Check) may be performed.

Monitors with a "Has Run" status indicate that all the required conditions they needed to perform diagnosis and testing of their assigned engine area (system) have been met, and all diagnostic testing has completed successfully.

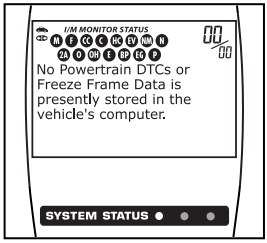
Monitors with a "Has Not Run" status have not yet met the conditions they need to perform diagnosis and testing of their assigned engine area (system), and have not been able to perform diagnostic testing on that system.

The green, yellow and red LEDs provide a quick way to help you determine if a vehicle is ready for an Emissions Test (Smog Check). Follow the instructions below to perform the Quick Check.

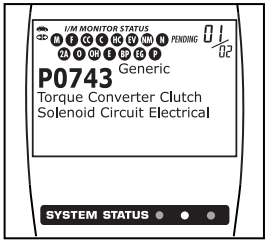
Perform the CODE RETRIEVAL PROCEDURE as described on page 33, then interpret the LED indications as follows:

Interpreting I/M Readiness Test Results

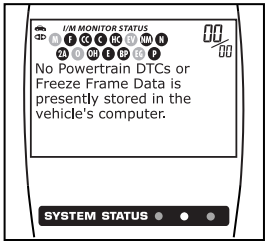
1. **GREEN LED** - Indicates that all engine systems are "OK" and operating normally (all Monitors supported by the vehicle have run and performed their self-diagnostic testing). The vehicle is ready for an Emissions Test (Smog Check), and there is a good possibility that it can be certified.



2. **YELLOW LED** - Determine from the CODE RETRIEVAL PROCEDURE (page 33) which of the two possible conditions is causing the yellow LED to light.

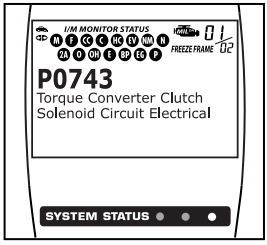


   - If a "PENDING" Diagnostic Trouble Code is causing the yellow LED to light, it is possible that the vehicle will be allowed to be tested for emissions and certified. Currently, most areas (states / countries) will allow an Emissions Test (Smog Check) to be performed if the only code in the vehicle's computer is a "PENDING" Diagnostic Trouble Code.
   - If the illumination of the Yellow LED is being caused by monitors that “have not run” their diagnostic testing, then the issue of the vehicle being ready for an Emissions Test (Smog Check) depends on the emissions regulations and laws of your local area.
     - Some areas require that all Monitors indicate a "Has Run" status before they allow an Emissions Test (Smog Check) to be performed. Other areas only require that some, but not all, Monitors have run their self-diagnostic testing before an Emissions Test (Smog Check) may be performed.



From the code retrieval procedure, determine the status of each Monitor (a solid Monitor icon shows Monitor "Has Run" status, a flashing Monitor icon indicates "Has Not Run" status). Take this information to an emissions professional to determine (based on your test results) if your vehicle is ready for an Emissions Test (Smog Check).

3. **RED LED** - Indicates there is a problem with one or more of the vehicle's systems. A vehicle displaying a red LED is definitely not ready for an Emissions Test (Smog Check). The red LED is also an indication that there are Diagnostic Trouble Code(s) present (displayed on the Diagnostic Tool's screen). The Multifunction Indicator (Check Engine) Lamp on the vehicle's instrument panel will light steady. The problem that is causing the red LED to light must be repaired before an Emissions Test (Smog Check) can be performed. It is also suggested that the vehicle be inspected/repaired before driving the vehicle further.



4. **Flashing Red and Yellow LEDs** – Indicates that a "permanent" code has been set, and one or more of the vehicle's monitors has failed its diagnostic testing. A "permanent" DTC can be cleared *only* by the vehicle's computer following successful completion of the monitor that caused the fault to set.

   If the Red LED or flashing RED and YELLOW LEDs were obtained, there is a definite problem present in the system(s). In these cases, you have the following options.

   - Repair the vehicle yourself. If you are going to perform the repairs yourself, proceed by reading the vehicle service manual and following all its procedures and recommendations.
   - Take the vehicle to a professional to have it serviced. The problem(s) causing the red LED to light must be repaired before the vehicle is ready for an Emissions Test (Smog Check).

On some vehicle models, the computer will store non-emission related DTCs. These DTCs will not command the MIL on since they are not emission related. If the Diagnostic Tool retrieves one of these types of codes, the MIL will not be commanded on, and the Yellow LED on the Diagnostic Tool will be illuminated. In most cases, these types of codes will not prevent the Emissions Test from being performed.

Using the I/M Readiness Monitor Status to Confirm a Repair

The I/M Readiness Monitor Status function can be used (after repair of a fault has been performed) to confirm that the repair has been performed correctly, and/or to check for Monitor Run Status. Use the following procedure to determine I/M Readiness Monitor Status:

1. Using retrieved Diagnostic Trouble Codes (DTCs) and code definitions as a guide, and following manufacturer's repair procedures, repair the fault or faults as instructed.

2. After the fault or faults have been repaired, connect the Diagnostic Tool to the vehicle's DLC and erase the code or codes from the vehicle's computer memory.
   - See page 47 for procedures for ERASING DIAGNOSTIC TROUBLE CODES (DTCs) from the vehicle's on-board computer.
   - Write the codes down on a piece of paper for reference before erasing.
3. After the erase procedure is performed, most of the Monitor icons on the Diagnostic Tool's LCD display will be flashing. Leave the Diagnostic Tool connected to the vehicle, and perform a Trip Drive Cycle for each "flashing" Monitor:

Misfire, Fuel and Comprehensive Component Monitors run continuously and their icons will always be on solid, even after the erase function is performed.

   - Each DTC is associated with a specific Monitor. Consult the vehicle's service manual to identify the Monitor (or Monitors) associated with the faults that were repaired. Follow the manufacturer's procedures to perform a Trip Drive Cycle for the appropriate Monitors.
   - While observing the Monitor icons on the Diagnostic Tool's LCD display, perform a Trip Drive Cycle for the appropriate Monitor or Monitors.

If the vehicle needs to be driven in order to perform a Trip Drive Cycle, ALWAYS have a second person help you. One person should drive the vehicle while the other person observes the Monitor icons on the Diagnostic Tool for Monitor RUN status. Trying to drive and observe the Diagnostic Tool at the same time is dangerous, and could cause a serious traffic accident.

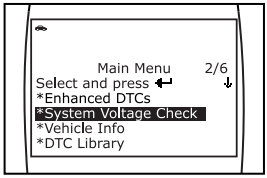
4. When a Monitor's Trip Drive Cycle is performed properly, the Monitor icon on the Diagnostic Tool's LCD display changes from "flashing" to "solid," indicating that the Monitor has run and finished its diagnostic testing.
   - If, after the Monitor has run, the MIL on the vehicle's dash is not lit, and no stored or pending codes associated with that particular Monitor are present in the vehicle's computer, the repair was successful.
   - If, after the Monitor has run, the MIL on the vehicle's dash lights and/or a DTC associated with that Monitor is present in the vehicle's computer, the repair was unsuccessful. Refer to the vehicle's service manual and recheck repair procedures.

PERFORMING A SYSTEM VOLTAGE CHECK

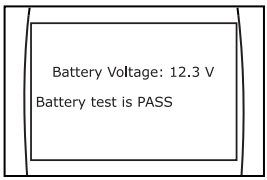
The Diagnostic Tool can perform a check of the vehicle's battery and charging system to ensure the system is operating within acceptable limits. You can perform a battery check *only*, or a charging system (battery and alternator) check.

To perform a battery check ONLY:

1. With the Diagnostic Tool on the Code Retrieval screen, press and release the **M** (M) button.
   - The Main Menu displays.



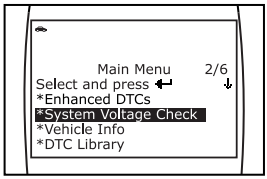
2. Use the **DOWN** (⌄) button to highlight **System Voltage Check**, then press the **ENTER** (↵) button.
   - A "One moment please" message displays, while the Diagnostic Tool retrieves the requested information.
3. When the battery check is complete, a results screen displays the current **Battery Voltage**, and indicates whether or not the voltage is within acceptable limits. The System Status LEDs provide a PASS/FAIL indication, as follows:
   - Green = PASS
   - Yellow = Caution/LOW
   - Red = FAIL

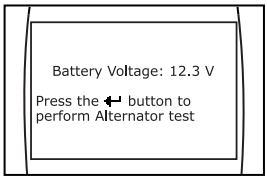


4. Press the **M** (M) button to return to the Main Menu.

To perform a charging system check:

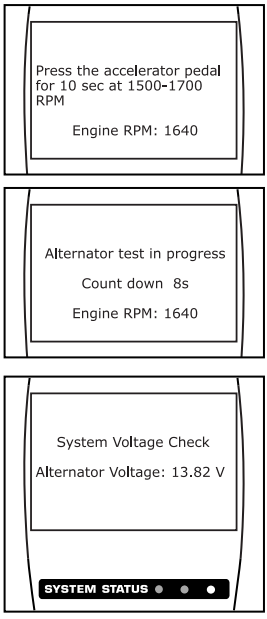
1. Start the engine.
2. With the Diagnostic Tool on the Code Retrieval screen, press and release the **M** (M) button.
   - The Main Menu displays.
3. Use the **DOWN** (⌄) button to highlight **System Voltage Check**, then press the **ENTER** (↵) button.
   - A "One moment please" message displays, while the Diagnostic Tool retrieves the requested information.
4. When the battery check is complete, a results screen displays the current Battery Voltage.





5. Press the **ENTER** (↵) button to perform the alternator check.
   - An instructional screen displays.

6. Press the accelerator pedal to raise engine speed to 1500~1700 RPM, and maintain the engine speed for 10 seconds.
   - When engine speed is within the required range, the alternator test begins. A progress screen shows the **Engine RPM** and **Count down** (time remaining until the test is complete).
7. When the alternator check is complete, a results screen displays the current **Alternator Voltage**, and indicates whether or not the voltage is within acceptable limits. The System Status LEDs provide a PASS/FAIL indication, as follows:
   - Green = PASS
   - Yellow = Caution/LOW
   - Red = FAIL
   - If the alternator voltage is less than 9 V, the red, yellow and green **SYSTEM STATUS** LEDs will flash on and off.


Press the accelerator pedal for 10 sec at 1500-1700 RPM
Engine RPM: 1640
Alternator test in progress
Count down 8s
Engine RPM: 1640
System Voltage Check
Alternator Voltage: 13.82 V
SYSTEM STATUS

8. Press the **M** (M) button to return to the Main Menu.

VIEWING VEHICLE INFORMATION

The Diagnostic Tool offers three options for retrieving reference information for the vehicle under test; **Vehicle ID**, **Available Modules** and **IPT** (In-use Performance Tracking).

Retrieving Vehicle ID Information

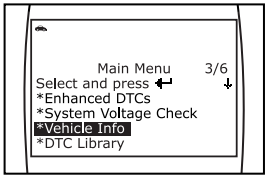
The Vehicle ID function is applicable to model year 2000 and newer OBD2-compliant vehicles.

The Diagnostic Tool can retrieve a list of information (provided by the vehicle manufacturer), unique to the vehicle under test, from the vehicle's on-board computer. This information may include:

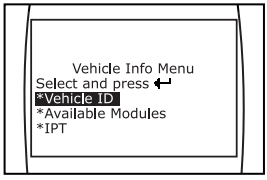
- The vehicle's VIN number
- The control module identification number
- The vehicle's calibration ID(s). These IDs uniquely identify the software version(s) for the vehicle's control module(s).
- The Vehicle's Calibration Verification Number(s) (CVNs) required by ODB2 regulations. CVNs are used to determine if emission-related calibrations for the vehicle under test have been changed. One or more CVNs may be returned by the vehicle's computer.

1. While linked to a vehicle, press and release the **M** (M) button.

- The Main Menu displays.



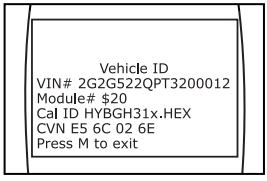
2. Use the **DOWN** ⊖ button to highlight **Vehicle Info**, then press the **ENTER** ⊕ button.
   - The Vehicle Info Menu displays.



3. Use the **DOWN** ⊖ button to highlight **Vehicle ID**, then press the **ENTER** ⊕ button.
4. A "One moment please..." message displays while the requested information is retrieved from the vehicle's computer.

*The first time the **Vehicle ID** function is used, it may take several minutes to retrieve the information from the vehicle's computer.*

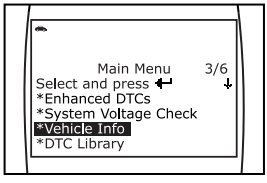
5. When the retrieval process is completed, the vehicle ID information is shown on the Diagnostic Tool's display. Use the **DOWN** ⊖ button to view the entire list.
6. When you have finished viewing the retrieved vehicle ID information, press the **M** Ⓜ button to exit.



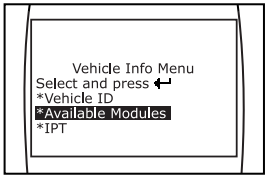
Viewing Available Modules

The Diagnostic Tool can retrieve a list of modules supported by the vehicle under test.

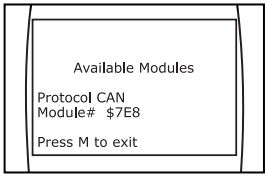
1. While linked to a vehicle, press and release the **M** Ⓜ button.
   - The Main Menu displays.



2. Use the **DOWN** ⊖ button to highlight **Vehicle Info**, then press the **ENTER** ⊕ button.
   - The Vehicle Info Menu displays.



3. Use the **DOWN** ⊖ button to highlight **Available Modules**, then press the **ENTER** ⊕ button.
4. A "One moment please..." message displays while the requested information is retrieved from the vehicle's computer.
5. When the retrieval process is completed, a complete list of modules supported by the vehicle under test is shown on the Diagnostic Tool's display. Use the **DOWN** ⊖ button to view the entire list.

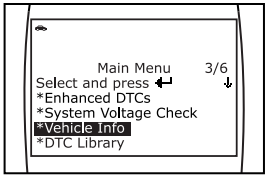


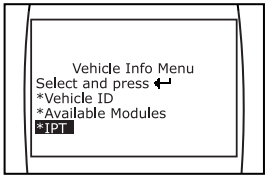
6. When you have finished viewing the list of available modules, press the **M** (M) button to exit.

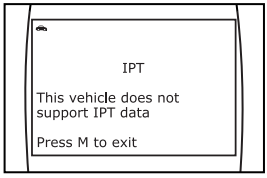
Viewing In-use Performance Tracking (IPT)

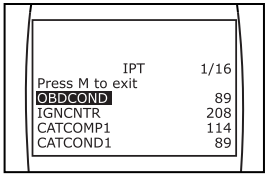
The Diagnostic Tool can retrieve In-use Performance Tracking (IPT) statistics for monitors supported by the vehicle under test. Two values are returned for each monitor; the number of times that all conditions necessary for a specific monitor to detect a malfunction have been encountered (XXXCOND), and the number of times that the vehicle has been operated under the specific conditions for the monitor (XXXCOMP). Statistics are also provided for the number of times the vehicle has been operated in OBD monitoring conditions (OBDCOND), and the number of times the vehicle's engine has been started (IGNCNTR).

1. While linked to a vehicle, press and release the **M** (M) button.
   - The Main Menu displays.
2. Use the **DOWN** (⌄) button to highlight **Vehicle Info**, then press the **ENTER** (↵) button.
   - The Vehicle Info Menu displays.
3. Use the **DOWN** (⌄) button to highlight **IPT**, then press the **ENTER** (↵) button.
4. A "One moment please . . ." message displays while the requested information is retrieved from the vehicle's computer.
   - If In-use Performance Tracking is not supported by the vehicle under test, an advisory message shows on the Diagnostic Tool's display. Press the **M** (M) button to exit.
5. When the retrieval process is completed, In-use Performance Tracking statistics for monitors supported by the vehicle under test are shown on the Diagnostic Tool's display. Use the **DOWN** (⌄) button to view the entire list.
6. When you have finished viewing the statistics, press the **M** (M) button to exit.







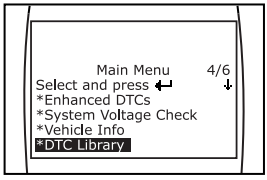


USING THE DTC LIBRARY

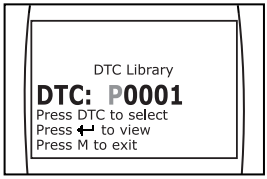
The **DTC Library** function lets you search the library of OBD2 DTC definitions.

1. While linked to a vehicle, press and release the **M** (M) button.

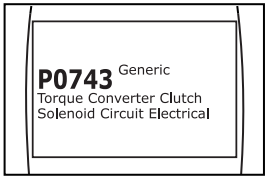
- The Main Menu displays.



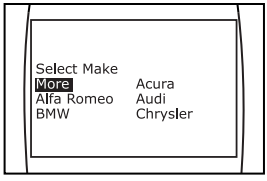
2. Use the **DOWN** button to highlight **DTC Library** in the **Menu**, then press the **ENTER** button.
   - The Enter DTC screen displays. The screen shows the code "P0001", with the "P" highlighted.

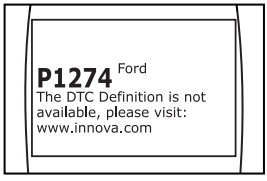


3. Use the **DOWN** button, as necessary, to scroll to the desired DTC type (P=Powertrain, U=Network, B=Body, C=Chassis), then press the **DTC** button.
   - The selected character displays "solid", and the next character is highlighted.
4. Select the remaining characters in the DTC in the same way, pressing the **DTC** button to confirm each character. When you have selected all the DTC characters, press the **ENTER** button to view the DTC definition.
   - If you entered a "Generic" DTC (DTCs that start with "P0", "P2" and some "P3"):
     - The selected DTC and DTC definition (if available), show on the Diagnostic Tool's LCD display.



   - If you entered a "Manufacturer-Specific" DTC (DTCs that start with "P1" and some "P3"):
     - The "Select Manufacturer" screen displays.
     - Use the **DOWN** button, as necessary, to highlight the appropriate manufacturer, then press the **ENTER** button to display the correct DTC for your vehicle.





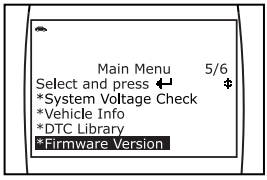
If a definition for the DTC you entered is not available, an advisory message shows on the Diagnostic Tool's display.

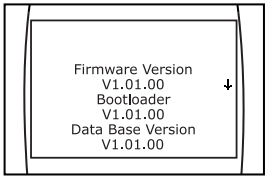
5. If you wish to view definitions for additional DTCs, press the **ENTER** button to return to the DTC Library screen, and repeat steps 2 and 3.
6. When all desired DTCs have been viewed, press the **M** button to exit the DTC Library.

VIEWING THE FIRMWARE VERSION

The Firmware Version function displays the firmware version, bootloader version and database version for the Diagnostic Tool.

1. While linked to a vehicle, press and release the **M** (M) button.
   - The Main Menu displays.
2. Use the **DOWN** (⊖) button to highlight **Firmware Version** in the **Menu**, then press the **ENTER** (↵) button.
   - The Firmware Version screen displays.
   - The screen shows the Diagnostic Tool's current firmware version, bootloader version and data base version.
3. Press the **M** (M) button to return to the **Menu**.





ADJUSTMENTS AND SETTINGS

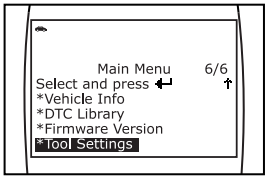
The Diagnostic Tool lets you make several adjustments and settings to configure the Diagnostic Tool to your particular needs. It also contains an OBD2 DTC Library that allows you to search for DTC definitions. The following functions, adjustments and settings can be performed when the Diagnostic Tool is in "MENU Mode":

- **Adjust Brightness:** Adjusts the brightness of the LCD display screen.
- **Audible Tone:** Turns the Diagnostic Tool's audible tone "on" and "off." When turned "on," a tone sounds each time a button is pressed.
- **Display Backlight:** Turns the display backlight on and off.
- **Select Language:** Sets the display language for the Diagnostic Tool to English, French or Spanish.
- **Unit of Measurement:** Sets the Unit of Measurement for the Diagnostic Tool's display to USA or Metric.

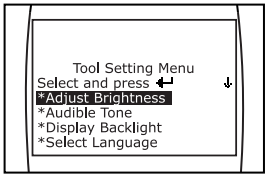
Adjustments and settings can be made only when the Diagnostic Tool is NOT connected to a vehicle.

To enter the MENU Mode:

1. With the Diagnostic Tool on the Code Retrieval screen, press and release the **M** (M) button.
   - The Main Menu displays.

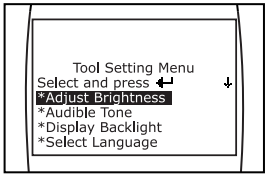


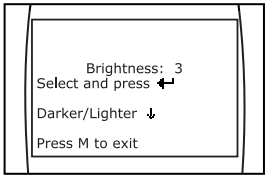
2. Use the **DOWN** ⊖ button to highlight **Tool Settings**, then press the **ENTER** ⊕ button.
   - The Tool Setting Menu displays.
3. Make adjustments and settings as described in the following paragraphs.



Adjusting Display Brightness

1. Use the **DOWN** ⊖ button to highlight **Adjust Brightness** in the **Menu**, then press the **ENTER** ⊕ button.
   - The Adjust Brightness screen displays.
   - The **Brightness** field shows the current brightness setting, from 1-4.
2. Press the **DOWN** ⊖ button to increase the brightness of the LCD display (make the display lighter).
   - When the *maximum* brightness setting is reached and the **DOWN** ⊖ button is pressed, the display returns to the *minimum* brightness setting.



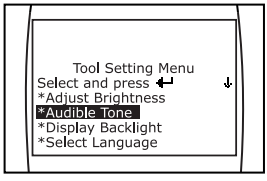


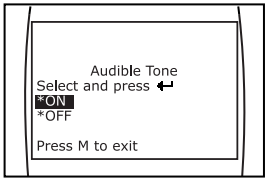
3. When the desired brightness is obtained, press the **ENTER** ⊕ button to save your changes and return to the **Menu**.

*To exit the Adjust Brightness screen and return to the **Menu** without making changes, press the **M** (M) button.*

Enabling the Audible Tone

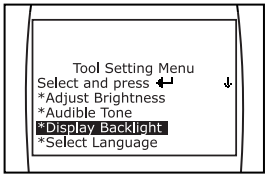
1. Use the **DOWN** ⊖ button to highlight **Audible Tone** in the **Menu**, then press the **ENTER** ⊕ button.
   - The Audible Tone screen displays.
2. Press the **DOWN** ⊖ button, as necessary, to highlight **ON** or **OFF** as desired.
3. When the desired option is selected, press the **ENTER** ⊕ button to save your changes and return to the **Menu**.



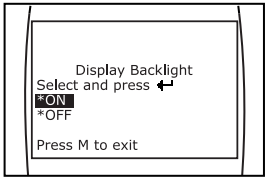


*To exit the Audible Tone screen and return to the **Menu** without making changes, press the **M** (M) button.*

Using the Backlight



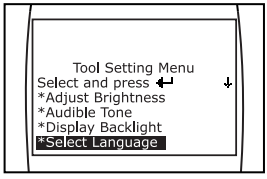
1. Use the **DOWN** button to highlight **Display Backlight** in the **Menu**, then press the **ENTER** button.
   - The Display Backlight screen displays.
2. Press the **DOWN** button, as necessary, to select the desired backlight mode, either **ON** or **OFF**.
3. When the desired backlight mode is selected, press the **ENTER** button to save your changes.



   - The display returns to the **Menu**, and the backlight turns "on" or "off" as selected.

*To exit the Display Backlight screen and return to the **Menu** without making changes, press the **M** button.*

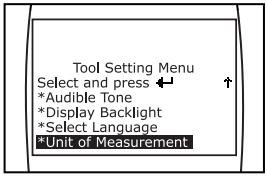
Selecting the Display Language



1. Use the **DOWN** button to highlight **Select Language** in the **Menu**, then press the **ENTER** button.
   - The Select Language screen displays.
   - The currently selected display **Language** is highlighted.
2. Press the **DOWN** button, as necessary, to highlight the desired display language.
3. When the desired display language is highlighted, press the **ENTER** button to save your changes and return to the **Menu** (shown in the selected display language).

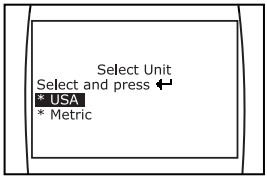
*To exit the Select Language screen and return to the **Menu** without making changes, press the **M** button.*

Setting the Unit of Measurement



1. Use the **DOWN** button to highlight **Unit of Measurement** in the **Menu**, then press the **ENTER** button.

- The Unit of Measurement screen displays.
- The currently selected **Unit of Measurement** is highlighted.



2. Press the **DOWN** ⊖ button, as necessary, to highlight the desired **Unit of Measurement**.
3. When the desired **Unit of Measurement** value is selected, press the **ENTER** ↵ button to save your changes and return to the **Menu**.

*To exit the Unit of Measurement screen and return to the **Menu** without making changes, press the **M** (M) button.*

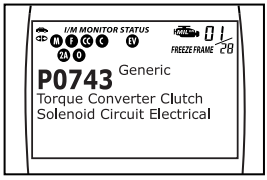
Exiting the MENU Mode

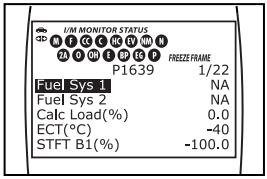
1. Press the **M** (M) button.
   - The LCD display returns to the DTC screen (if data is currently stored in the Diagnostic Tool's memory) or the "To Link" screen (if no data is stored).

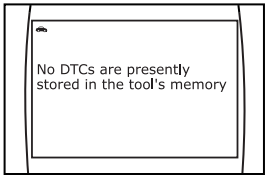
VIEWING DTCs IN THE TOOL'S MEMORY

To view DTCs and other diagnostic data stored in the Diagnostic Tool's memory, do the following:

1. With the DLC cable not connected to the Diagnostic Tool, press the **POWER/LINK** button to turn the Tool "on."
2. If DTCs are present in the Diagnostic Tool's memory, the first stored DTC will display on the screen.
   - If more than one DTC is present, use the **DTC** button to scroll through the DTCs.
3. Saved Freeze Frame data and monitor status are also available. Press the **DTC** button to view Freeze Frame data for the "priority" DTC (DTC #1).
4. If no DTCs are stored in the Diagnostic Tool's memory, a "No DTCs or Freeze Frame Data is presently stored in the tool's memory" message displays.







The following is a list of Generic (Global) PIDs and their descriptions.

Tool Display	Unit	Value	PID Description
ACC Pedal D	%	XXX.X	Accelerator Pedal Position D
ACC Pedal E	%	XXX.X	Accelerator Pedal Position E
ACC Pedal F	%	XXX.X	Accelerator Pedal Position F
Air Status	-	UPS, DNS, OFF	Commanded Secondary Air Status
Ambient	*C / *F	XXX	Ambient Air Temperature
Aux Input Status	-	On / Off	Auxiliary Input Status
BARO	kPa /inHg	XXX / XX.X	Barometric Pressure
Calc LOAD	%	XXX.X	Calculated LOAD Value
CAT Temp 11	*C / *F	XXXX.X	Catalyst Temperature Bank 1-Sensor 1
CAT Temp 12	*C / *F	XXXX.X	Catalyst Temperature Bank 1-Sensor 2
CAT Temp 21	*C / *F	XXXX.X	Catalyst Temperature Bank 2-Sensor 1
CAT Temp 22	*C / *F	XXXX.X	Catalyst Temperature Bank 2-Sensor 2
Command EGR	%	XXX.X	Commanded EGR
Command EVAP	%	XXX.X	Commanded Evaporative Purge
Command TAC	%	XXX.X	Commanded Throttle Actuator
Dist DTC Clr	km /mile	XXXXX	Distance since DTC Cleared
Dist MIL ON	km /miles	XXXXX	Distance Traveled while MIL ON
ECT	*C / *F	XXX / XXX	Engine Coolant Temp
ECU Volts	V	XX.XXX	Control Module Voltage
EGR Error	%	XXX.X	EGR Error
Eng RPM	min	XXXXX	Engine RPM
EQ Ratio	-	X.XXX	Commanded Equivalence Ratio
EQ Ratio 11	-	X.XXX	Bank 1 - Sensor 1 Equivalence Ratio
EQ Ratio 12	-	X.XXX	Bank 1 - Sensor 2 Equivalence Ratio
EQ Ratio 13	-	X.XXX	Bank 1 - Sensor 3 Equivalence Ratio
EQ Ratio 14	-	X.XXX	Bank 1 - Sensor 4 Equivalence

Tool Display	Unit	Value	PID Description
			Ratio
EQ Ratio 21	-	X.XXX	Bank 2 - Sensor 1 Equivalence Ratio
EQ Ratio 22	-	X.XXX	Bank 2 - Sensor 2 Equivalence Ratio
EQ Ratio 23	-	X.XXX	Bank 2 - Sensor 3 Equivalence Ratio
EQ Ratio 24	-	X.XXX	Bank 2 - Sensor 4 Equivalence Ratio
EVAP Press	Pa /in H2O	XXXX.XX /XX.XXX	Evap System Vapor Pressure
FP / Vac	kPa /PSI	XXXX.XXX /XXX.X	Fuel Rail Pressure relative toVacuum
Fuel Level	%	XXX.X	Fuel Level Input
Fuel Press	kPa /PSI	XXX / XX.X	Fuel Rail Pressure
Fuel Press	kPa /PSI	XXXXX /XXXX.X	Fuel Rail Pressure
Fuel Sys 1	-	OL	Fuel System 1 Status
Fuel Sys 1	-	CL	Fuel System 1 Status
Fuel Sys 1	-	OL-Drive	Fuel System 1 Status
Fuel Sys 1	-	OL-Fault	Fuel System 1 Status
Fuel Sys 1	-	CL-Fault	Fuel System 1 Status
Fuel Sys 2	-	OL	Fuel System 2 Status
Fuel Sys 2	-	CL	Fuel System 2 Status
Fuel Sys 2	-	OL-Drive	Fuel System 2 Status
Fuel Sys 2	-	OL-Fault	Fuel System 2 Status
Fuel Sys 2	-	CL-Fault	Fuel System 2 Status
IAT	*C / *F	XXX / XXX	Intake Air Temperature
LOAD Value	%	XXX.X	Absolute Load Value
LTFT B1	%	XXX.X	Long Term Fuel Trim-Bank 1
LTFT B2	%	XXX.X	Long Term Fuel Trim-Bank 2
LTFT B3	%	XXX.X	Long Term Fuel Trim-Bank 3
LTFT B4	%	XXX.X	Long Term Fuel Trim-Bank 4
MAF	g/s ;lb/min	XXX.XX /XXXX.X	Air Flow Rate from Mass Air Flow Sensor
MAP	kPa /PSI	XXX / XX.X	Intake Manifold Absolute Pressure
MIL On Time	hrs, min	XXXX, XX	Engine Run Time while MIL ON
Monitor Status	-	ICONS on Display	Monitor Status this Driving Cycle
O2S B1 S1	V	X.XXX	Bank 1 - Sensor 1
O2S B1 S1	mA	X.XXX	Bank 1 - Sensor 1 O2S Current

Tool Display	Unit	Value	PID Description
mA			
O2S B1 S1 V	V	X.XXX	Bank 1 - Sensor 1 O2S Voltage
O2S B1 S2	V	X.XXX	Bank 1 - Sensor 2
O2S B1 S2 mA	mA	X.XXX	Bank 1 - Sensor 2 O2S Current
O2S B1 S2 V	V	X.XXX	Bank 1 - Sensor 2 O2S Voltage
O2S B1 S3	V	X.XXX	Bank 1 - Sensor 3
O2S B1 S3 mA	mA	X.XXX	Bank 1 - Sensor 3 O2S Current
O2S B1 S3 V	V	X.XXX	Bank 1 - Sensor 3 O2S Voltage
O2S B1 S4	V	X.XXX	Bank 1 - Sensor 4
O2S B1 S4 mA	mA	X.XXX	Bank 1 - Sensor 4 O2S Current
O2S B1 S4 V	V	X.XXX	Bank 1 - Sensor 4 O2S Voltage
O2S B2 S1	V	X.XXX	Bank 2 - Sensor 1
O2S B2 S1 mA	mA	X.XXX	Bank 2 - Sensor 1 O2S Current
O2S B2 S1 V	V	X.XXX	Bank 2 - Sensor 1 O2S Voltage
O2S B2 S2	V	X.XXX	Bank 2 - Sensor 2
O2S B2 S2 mA	mA	X.XXX	Bank 2 - Sensor 2 O2S Current
O2S B2 S2 V	V	X.XXX	Bank 2 - Sensor 2 O2S Voltage
O2S B2 S3	V	X.XXX	Bank 2 - Sensor 3
O2S B2 S3 mA	mA	X.XXX	Bank 2 - Sensor 3 O2S Current
O2S B2 S3 V	V	X.XXX	Bank 2 - Sensor 3 O2S Voltage
O2S B2 S4	V	X.XXX	Bank 2 - Sensor 4
O2S B2 S4 mA	mA	X.XXX	Bank 2 - Sensor 4 O2S Current
O2S B2 S4 V	V	X.XXX	Bank 2 - Sensor 4 O2S Voltage
O2S Location	-	O2S11	Oxygen Sensor, Bank 1, Sensor 1
O2S Location	-	O2S12	Oxygen Sensor, Bank 1, Sensor 2
O2S Location	-	O2S13	Oxygen Sensor, Bank 1, Sensor 3
O2S Location	-	O2S14	Oxygen Sensor, Bank 1, Sensor 4
O2S Location	-	O2S21	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S22	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S23	Oxygen Sensor, Bank 2, Sensor 3
O2S Location	-	O2S24	Oxygen Sensor, Bank 2, Sensor 4
O2S Location	-	O2S11	Oxygen Sensor, Bank 1, Sensor 1
O2S Location	-	O2S12	Oxygen Sensor, Bank 1, Sensor 2
O2S Location	-	O2S21	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S22	Oxygen Sensor, Bank 2, Sensor 2
O2S Location	-	O2S31	Oxygen Sensor, Bank 3, Sensor 1
O2S Location	-	O2S32	Oxygen Sensor, Bank 3, Sensor 2
O2S Location	-	O2S41	Oxygen Sensor, Bank 4, Sensor 1
O2S Location	-	O2S42	Oxygen Sensor, Bank 4, Sensor 2

Tool Display	Unit	Value	PID Description
OBD Support	-	OBD2	OBD Requirements
OBD Support	-	OBD	OBD Requirements
OBD Support	-	OBD and OBD2	OBD Requirements
OBD Support	-	OBD1	OBD Requirements
OBD Support	-	No OBD	OBD Requirements
OBD Support	-	EOBD	OBD Requirements
OBD Support	-	EOBD and OBD2	OBD Requirements
OBD Support	-	EOBD and OBD	OBD Requirements
OBD Support	-	EOBD, OBD and OBD2	OBD Requirements
OBD Support	-	JOBD	OBD Requirements
OBD Support	-	JOBD and OBD2	OBD Requirements
OBD Support	-	JOBD and EOBD	OBD Requirements
OBD Support	-	JOBD, EOBD and OBD2	OBD Requirements
PTO Status	-	On / Off	Power Take Off Status
Rel TPS	%	XXX.X	Relative Throttle Position
Spark Adv	deg	XX	Ignition Timing Advance #1 Cylinder
STFT B1	%	XXX.X	Short Term Fuel Trim-Bank 1
STFT B1 S1	%	XXX.X	Bank 1 - Sensor 1
STFT B1 S2	%	XXX.X	Bank 1 - Sensor 2
STFT B1 S3	%	XXX.X	Bank 1 - Sensor 3
STFT B1 S4	%	XXX.X	Bank 1 - Sensor 4
STFT B2	%	XXX.X	Short Term Fuel Trim-Bank 2
STFT B2 S1	%	XXX.X	Bank 2 - Sensor 1
STFT B2 S2	%	XXX.X	Bank 2 - Sensor 2
STFT B2 S3	%	XXX.X	Bank 2 - Sensor 3
STFT B2 S4	%	XXX.X	Bank 2 - Sensor 4
STFT B3	%	XXX.X	Short Term Fuel Trim-Bank 3
STFT B4	%	XXX.X	Short Term Fuel Trim-Bank 4
Time DTC Clr	hrs, min	XXXX, XX	Time since DTC Cleared
Time Since Start	sec	XXXX	Time Since Engine Start
TPS	%	XXX.X	Absolute Throttle Position
TPS B	%	XXX.X	Absolute Throttle Position B
TPS C	%	XXX.X	Absolute Throttle Position C

Tool Display	Unit	Value	PID Description
Veh Speed	km/h / mph	XXX / XXX	Vehicle Speed Sensor
Warm-up DTC Clr	-	XXX	# Warm-ups since DTC Cleared

ABS APPLICATIONS – DOMESTIC

Chrysler

CHRYSLER			
Model	**Year**	**Model**	**Year**
300	2005-2009	LHS	1998-2001
300 SRT-8	2007-2009	Pacifica	2004-2006
300m	1999-2004	PT Cruiser	2001-2009
Aspen	2007-2009	Sebring	2001-2010
Caliber SRT-4	2007	Town & Country	2001-2009
Concorde	1998-2004	Voyager	2001-2003
Crossfire (excludes SRT-6)	2008		
DODGE			
Model	**Year**	**Model**	**Year**
Avenger	2008-2009	Neon	2000-2005
Caliber	2007	Nitro	2007-2009
Caravan	2001-2007	Ram 1500	2002-2009
Charger	2006-2009	Ram 2500	2003-2009
Charger SRT-8	2006-2009	Ram 3500	2003-2009
Dakota	2001-2009	Ram SRT-10	2004-2006
Durango	2001-2009	Sprinter 2500	2007
Grand Caravan	2001-2002, 2004-2009	Sprinter 3500	2007
Intrepid	1998-2004	SRT-4	2003-2005
Journey	2009	Stratus Sedan	2001-2006
Magnum	2005-2008	Viper	2001-2002
Magnum SRT-8	2006-2007		
JEEP			
Model	**Year**	**Model**	**Year**
Commander	2006-2009	Liberty	2002-2011
Compass	2007-2009	Patriot	2007
Grand Cherokee	1999-2009	Wrangler	2004-2009
Grand Cherokee SRT-8	2006,2008-2009		

Ford

FORD			
Model	**Year**	**Model**	**Year**
Contour	1996-2000	F-350 (excludes Diesel engines)	1999-2010
Crown Victoria	1996-2010	F-450 (excludes Diesel engines)	2008-2010
E-150 (excludes Diesel engines)	1997-2010	F-550 (excludes Diesel engines)	2008-2010
E-250 (excludes Diesel engines)	1997-2010	Five Hundred	2005-2007
E-350 (excludes Diesel engines)	1997-2010	Flex	2009-2010
E-450 (excludes Diesel engines)	2008-2010	Focus	2000-2010
Edge	2007-2010	Freestar	2004-2007
Escape	2001-2010	Fusion	2006-2010
Escort	1997-2003	Mustang	1996-2010
Excursion (excludes Diesel engines)	2000-2005	Ranger	1996-2010
Expedition	1997-2010	Taurus	1996-2010
Explorer	1996-2010	Taurus X	2008-2009
Explorer Sport Trac	2001-2005, 2007-2010	Thunderbird	1996,2002-2005
F-150 (excludes 1998 w/ Vin Z)	1997-2010	Transit Connect	2010
F-250 (excludes Diesel engines)	1997-2010	Windstar	1996-2003
LINCOLN			
Model	**Year**	**Model**	**Year**
Aviator	2003-2005	MKT	2010
Blackwood	2002	MKX	2007-2010
Continental	1996-2002	MKZ	2007-2010
LS	2002-2006	Navigator	1998-2010
Mark LT	2006-2008	Town Car	1998-2010
Mark VIII	1997-1998	Zephyr	2006
MKS	2009-2010		
MERCURY			
Model	**Year**	**Model**	**Year**
Cougar	1999-2002	Montego	2005-2007
Grand Marquis	1996-2010	Mountaineer	1997-2010
Marauder	2003-2004	Mystique	1996-2000
Mariner	2005-2010	Sable	1996-2005, 2008-2009
Milan	2006-2010	Tracer	1997-1999

GM

BUICK			
Model	**Year**	**Model**	**Year**
Century	1997-2005	Park Avenue	1997-2005
Enclave	2008-2011	Rainier	2004-2007
LaCrosse	2005-2011	Regal	1997-2004,2011
LeSabre	1999-2005	Rendezvous	2002-2007
Lucerne	2006-2011	Terraza	2005-2007
CADILLAC			
Model	**Year**	**Model**	**Year**
Cavalier	2000-2005	Escalade	1999-2000, 2002-2011
CTS	2003-2010	Seville	1997-2004
DeVille	1997-2005	SRX	2004-2011
DTS	2006-2011	STS	2005-2011
Eldorado	1997-2002	XLR	2004-2009
CHEVROLET			
Model	**Year**	**Model**	**Year**
Astro Van	1996-2005	K 1500	1996-2003
Avalanche	2002-2011	K 2500	1996-2003
Aveo	2004-2011	K 3500	1996-2003
Blazer	1996-2005	Lumina	1996
C 1500	1996-2003	Malibu	1997-2011
C 2500	1996-2003	Monte Carlo	2000-2007
C 3500	1996-2003	Prizm	1998-2002
Camaro	1999-2002, 2010-2011	S10	1996-2004
Cavalier	2000-2005	Silverado 1500	2004-2007
Classic	2004-2005	Silverado 2500	2004-2007
Cobalt	2005-2010	Silverado 3500	2004-2007
Colorado	2004-2011	Silverado Classic 1500	2007-2011
Corvette	1997-2011	Silverado Classic 2500	2007-2011
Cruze	2011	Silverado Classic 3500	2007-2011
Equinox	2005-2011	Silverado SS	2003-2008
Express 1500	1998-2011	SSR	2003-2006
Express 2500	1998-2011	Surburban	1996-2011
Express 3500	1998-2011	Tahoe	1996-2011
Express 4500	2009-2011	Tracker	1999-2004
G 10	1996-1997	TrailBlazer	2002-2009
G 20	1996-1997	Traverse	2009-2011
G 30	1996-1997	Uplander	2005-2008
HHR	2006-2011	Venture	2000-2005
Impala	2000-2011		

GMC			
Model	**Year**	**Model**	**Year**
Acadia	2007-2011	Savana 1500	1998-2011
C 1500	1996-2003	Savana 2500	1998-2011
C 2500	1996-2003	Savana 3500	1998-2011
C 3500	1996-2003	Savana 4500	2009-2011
Canyon	2004-2011	Sierra 1500	2004-2011
Envoy	1998-2000, 2002-2009	Sierra 2500	2004-2011
G 1500	1996-1997	Sierra 3500	2004-2011
G 2500	1996-1997	Sierra Classic	2007
G 3500	1996-1997	Sierra Denali	2003-2011
Jimmy	1996-2002	Sonoma	1996-2004
K 1500	1996-2003	Terrain	2010-2011
K 2500	1996-2003	Yukon	1996-2011
K 3500	1996-2003	Yukon XL / Denali	2004-2011
Safari	1996-2005		

HUMMER			
Model	**Year**	**Model**	**Year**
H2	2003-2009	H3	2006-2010

OLDSMOBILE			
Model	**Year**	**Model**	**Year**
Alero	1999-2004	Cutlass	1997-1999
Aurora	2001-2003	Intrigue	1998-2002
Bravada	1996-2004	Silhouette	2000-2004

PONTIAC			
Model	**Year**	**Model**	**Year**
Aztek	2001-2005	Grand Prix	2004-2008
Bonneville	2000-2005	GTO	2006
Firebird	1999-2002	Montana	2000-2005
G3	2009	Montana SV6	2005-2007
G5	2007-2009	Solstice	2006-2009
G6	2005-2010	Sunfire	2000-2005
G8	2008-2009	Torrent	2006-2009
Grand AM	1999-2005	Vibe	2003-2008

ABS APPLICATIONS – ASIAN

Honda

ACURA			
Model	**Year**	**Model**	**Year**
CL	1998-1999, 2001-2003	RL	1998-2009
Integra	1998-2001	RSX	2002-2006
MDX	2001-2009	SLX	1996-1999
NSX	2000-2004	TL	1997-2009
RDX	2007-2009	TSX	2004-2009
HONDA			
Model	**Year**	**Model**	**Year**
Accord	1998-2009	Odyssey	1998-2009
Civic	1996-2009	Pilot	2003-2009
CR-V	1997-2009	Prelude	1997-2001
Element	2003-2008	Ridgeline	2007-2008
Fit	2007-2009	S2000	2000-2009
Insight	2000-2005		

Toyota

LEXUS			
Model	**Year**	**Model**	**Year**
ES 300	1999-2000, 2002-2003	LS 400	1998-2000
ES 330	2004-2006	LS 430	2001-2006
ES 350	2007-2011	LS 460	2007-2011
GS 300	1998-2006	LS 600h	2008-2010
GS 350	2007-2011	LX 470	1998-2007
GS 400	1998-2000	LX 570	2008-2011
GS 430	2001-2007	RX 300	2001-2003
GX 470	2003-2009	RX 330	2004-2006
IS 250	2006-2008	RX 350	2007-2011
IS 300	2001-2005	SC 300	1999-2000
IS 350	2006-2009	SC 400	1999-2000
IS F	2008-2009	SC 430	2002-2010
SCION			
Model	**Year**	**Model**	**Year**
tC	2005-2010	xB	2004-2006, 2009-2010
xA	2004-2006		

TOYOTA			
Model	**Year**	**Model**	**Year**
4-Runner	2001-2011	Matrix	2003-2011
Avalon	2002-2011	MR2 Spyder	2000-2005
Camry	2000-2011	Prius	2001-2009
Camry Solara	2000,2004-2008	Rav4	2001,2003-2011
Celica	2000-2005	Sequoia	2001-2011
Corolla	2000-2008	Sienna	2001-2010
Echo	2000-2001	Tacoma	2003-2010
FJ Cruiser	2007-2011	Tundra	2000-2010
Highlander (excludes Hybrid models)	2001-2011	Yaris	2007
Land Cruiser	2000-2010		

INTRODUCTION

This Glossary contains definitions for abbreviations and terms you may find in this manual or in your vehicle service manual.

GLOSSARY OF TERMS AND ABBREVIATIONS

CARB – California Air Resources Board

CCM – Central Control Module

Computer Control System – An electronic control system, consisting of an on-board computer and related sensors, switches and actuators, used to ensure peak performance and fuel efficiency while reducing pollutants in the vehicle's emissions.

DIY – Do-It-Yourself

DLC – Data Link Connector

Drive Cycle – An extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life.

Driving Condition – A specific environmental or operation condition under which a vehicle is operated; such as starting the vehicle when cold, driving at steady speed (cruising), accelerating, etc.

DTC(s) – Diagnostic Trouble Code(s)

EGR – Exhaust Gas Recirculation

System Status – An indication of whether or not a vehicle's emissions-related system are operating properly and are ready for Inspection and Maintenance testing.

EPA – Environmental Protection Agency

EVAP – Evaporative Emissions System

Fault Code – See DTCs

Freeze Frame – A digital representation of engine and/or emissions system conditions present when a fault code was recorded.

FTP – Fuel Tank Pressure

Generic Code – A DTC that applies to all OBD2 compliant vehicles.

I/M Test / Emissions Test / Smog Check – A functional test of a vehicle to determine if tailpipe emissions are within Federal/State/Local requirements.

LCD – Liquid Crystal Display

LED – Light Emitting Diode

LTFT – Long Term Fuel Trim, is a program in the vehicle's computer designed to add or subtract fuel from the vehicle to compensate for operating conditions that vary from the ideal A/F ratio (long term).

Manufacturer Specific Code – A DTC that applies only to OBD2 compliant vehicles made by a specific manufacturer.

MIL – Malfunction Indicator Lamp (also referred to as "Check Engine" light

OBD1 – On-Board Diagnostics Version 1 (also referred to as "OBD I")

OBD2 – On-Board Diagnostics Version 2 (also referred to as "OBD II")

On-Board Computer – The central processing unit in the vehicle's computer control system.

PCM – Powertrain Control Module

Pending Code – A code recorded on the "first trip" for a "two-trip" code. If the fault that caused the code to be set is not detected on the second trip, the code is automatically erased.

STFT – Short Term Fuel Trim, is a program in the vehicle's computer designed to add or subtract fuel from the vehicle to compensate for operating conditions that vary from the ideal A/F ratio. The vehicle uses this program to make minor fuel adjustments (fine tune) on a short-term basis.

Trip Drive Cycle – Vehicle operation that provides the necessary driving condition to enable a vehicle Monitor to run and complete its diagnostic testing.

VECI – Vehicle Emission Control Information Decal

LIMITED ONE YEAR WARRANTY

The Manufacturer warrants to the original purchaser that this unit is free of defects in materials and workmanship under normal use and maintenance for a period of one (1) year from the date of original purchase.

If the unit fails within the one (1) year period, it will be repaired or replaced, at the Manufacturer's option, at no charge, when returned prepaid to the Service Center with Proof of Purchase. The sales receipt may be used for this purpose. Installation labor is not covered under this warranty. All replacement parts, whether new or remanufactured, assume as their warranty period only the remaining time of this warranty.

This warranty does not apply to damage caused by improper use, accident, abuse, improper voltage, service, fire, flood, lightning, or other acts of God, or if the product was altered or repaired by anyone other than the Manufacturer's Service Center.

The Manufacturer, under no circumstances shall be liable for any consequential damages for breach of any written warranty of this unit. This warranty gives you specific legal rights, and you may also have rights, which vary from state to state. This manual is copyrighted with all rights reserved. No portion of this document may be copied or reproduced by any means without the express written permission of the Manufacturer. THIS WARRANTY IS NOT TRANSFERABLE. For service, send via U.P.S. (if possible) prepaid to Manufacturer. Allow 3-4 weeks for service/repair.

SERVICE PROCEDURES

If you have any questions, require technical support or information on UPDATES and OPTIONAL ACCESSORIES, please contact your local store, distributor or the Service Center.

USA & Canada:

(800) 544-4124 (6:00 AM-6:00 PM, Monday-Saturday PST)

All others: (714) 241-6802 (6:00 AM-6:00 PM, Monday-Saturday PST)

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